UNITED STATES OF AMERICA:
WAR DEPARTMENT.

MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

MAY, 1887.

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List of merchant marine steam and sailing vessels from which International Simultaneous Meteorological reports were received at the Office of the Chief Signal Officer, U. S. Army, Washington, D. C., in time to be used in the preparation of the Weather Review for the month of May, 1887.

Name of vessel.	Captain.
Allan Line.	
Br. s. s. Buenos Ayrean	Capt. J. Scott.
Grecian	C. E. Le Gallias.
Hibernian	J. Brown.
Manitoban	W. Dalziel.
Prussian	J. Ambury.
Sarmatian	W. Richardson.
Scandinavian	John Park.
American Line.	
Br. s. s. British King	John Kelly.
British Prince	S. Nowell.
British Princess	E. H. Freeth.
Am. Illinois	G. H. Dodge.
Br. Lord Clive	P. Urquhart.
Lord Gough	E. E. Hughes.
Anglo-Australian Steamship Co.	
Br. s. s. Port Phillip	Geo. Dulling.
Anchor Line.	
Br. s. s. Australia	A. McRitchie.
Alsatia	J. Brown.
Alexandria	D. Pert.
Bolivia	J. J. Small.
Caledonia	A. T. Garvie.
City of Rome	E. D. Munro.
Columbia	T. Mitchell.
Circassia	A. Campbell.
Devonia	Hugh Young.
Dorian	J. McKeague.
Elysia	W. Baxter.
Ethiopia	John Wilson.
Arrow Line.	
Br. s. s. Critic	W. R. Lord.
Monte Rosa	C. Thomas.
Atlas Line.	
Br. s. s. Alba	J. W. Sanson.
Alvena	—. McKay.
Alvo	D. Williams.
Andes	T. M. MacKnight.
Atheo	H. Low.
Bordeaux Steam Navigation Co.	
Fr. s. s. Chateau Leoville	M. Le Chapelain.
Chateau Yquem	C. F. Journiel.
Bristol City Line.	
Br. s. s. Brooklyn City	W. Fitt.
Jersey City	E. Horlor.
Llandaff City	T. H. Gore.
Cromwell Line.	
Am. s. s. Louisiana	E. V. Gager.
New Orleans	T. P. C. Halsey.
Cunard Line.	
Br. s. s. Aurania	W. H. P. Hains.
Bothnia	T. Dutton.
Catalonia	Edward Wylie.
Cephalonia	Henry Walker.
Etruria	T. Cook.
Gallia	M. Murphy.
Pavonia	A. McKay.
Samaria	B. Watt.
Scythia	T. Roberts.
Servia	H. McKay.
Umbria	W. McMickan.
Edward Corv's S. S. Line.	
Ger. s. s. Amalfi	Julius Bahr.
Anstralia	G. Franck.
California	O. Winkler.
Marsala	N. Maass.
Polynesia	A. Kuhn.
Taormina	W. H. Frank.
Fabre Line.	
Fr. s. s. Neustria	P. Yerries.
Furness Line.	
Br. s. s. Stockholm City	K. Doyle.
General Trans-Atlantic Steamship Co.	
Fr. s. s. La Bourgogne	E. Franquel.
La Bretagne	M. de'Jousselin.
La Champagne	E. Traub.
La Gascogne	Santelli.
La Normandie	G. de Kersabiec.
Great Western S. S. Line.	
Br. s. s. Dorset	Ch. Off. E. Crossman.
Worcester	Capt. W. Stamper.
Guion Line.	
Br. s. s. Alaska	Geo. S. Murray.
Arizona	S. Brooks.
Wyoming	C. L. Rigby.
Hamburg-American Line.	
Ger. s. s. Gellert	W. Kuhlewein.
Gothia	C. Kordell.
Hammonia	H. F. Schwensen.
Hungaria	W. Leithauser.
Lessing	H. Barends.
Rhaetia	R. Karlowa.
Regia	A. Albers.
Slavonia	H. Schmidt.
Suevia	C. Ludwig.
Wieland	C. Hebich.
Inman Line.	
Br. s. s. City of Berlin	Francis S. Land.
City of Chester	A. Lewis.
City of Chicago	Fred Watkins.
City of Richmond	A. Redford.
City of Montreal	B. Leitch.
British Queen	E. Wills.
Johnston Line.	
Br. s. s. Baltimore	I. Treuery.
Neumore	John Inch.
Lamport & Holt's Steamship Company.	
Br. s. s. Bussel	C. J. Watson.
Biela	F. Graham.
Euclid	A. Matheson.
Humboldt	Jas. Grimes.
Macmyth	T. T. Farrell.
Mozart	W. Spratbly.
Others	Jas. Clark.
Leyland Line.	
Br. s. s. Bavarian	J. Owsinak.
Bulgarian	E. Parry.
Istrian	T. H. Fox.
Virginian	M. Fitt.

Name of vessel.	Captain.
Lord Line.	
Br. s. s. Rengore Head	Capt. J. R. Brady.
Lord Lansdowne	C. H. Baskill.
Lord O'Neill	James Dunn
Mediterranean & New York S. S. Co.	
Br. s. s Pontine	Ch. Off. R. Blyth
Mins. & Dominion S. S. Co.	
Br. s. s. Ontario	Capt. W. P. Couch.
Sarnia	Jos. Gibson.
Toronto	Jas. McAuley.
Vancouver	C. J. Lindall.
Morgan Line.	
Am. s. s. Eureka	R. B. Quick.
National Line.	
Br. s. s. Canada	Thos. Foote.
Denmark	R. S. Rigby.
Egypt	J. Sumner.
England	T. P. Heeley.
Erin	J. Robinson.
France	A. D. Hadley.
Greece	A. J. Jeffrey.
Helvetia	G. Cochrane.
Holland	Wm. Tyson.
Italy	Wm. Pearce.
Spain	W. A. Griffiths.
The Queen	John Milligan.
Navigazione Generale Italiana.	
It. s. s. Gottardo	Domenico Viola.
Indipendente	P. Pirandello.
Letimbro	2d Off. Fr. Diliberto.
Sturo	Capt. G. Cafiero.
New York and Cuba Mail S. S. Co.	
Am. s. s. Ulenfuegos	F. M. Faircloth.
N. Y., Havana & Mexican Mail S. S. Co.	
Am. s. s. City of Alexandria	J. W. Reynolds.
City of Washington	W. M. Rittig.
North German Lloyd Steamship Co.	
Ger. s. s. Aller	H. Christoffers.
America	H. Hineke.
Eider	P. H. Berdrow.
Elbe	G. Meyer.
Ems	Th. Jüngst.
Fulda	R. Ringk.
Hermann	A. Kohlmann.
Main	H. Boedcker.
Saale	H. Richter.
Trave	W. Willigerod.
Werra	R. Bussius.
Weser	H. Bruns.
Ocean Steamship Company.	
Am. s. s. City of Augusta	J. W. Catharine.
Oceanic Steamship Company.	
Am. s. s. Alameda	G. H. Morse.
Old Dominion Steamship Company.	
Am. s. s. Manhattan	Frank Stevens.
Oregon Railway and Navigation Co.	
Am. s. s. Columbia	Fred Bolles.
Oregon	E. Polemann.
Pacific Mail Steamship Company.	
Am. s. s. Acapulco	Chas. C. Lima.
City of New York	R. R. Searle.
City of Para	L. Dexter.
City of Peking	H. C. Dearborn.
City of Rio de Janeiro	W. B. Seabury.
Colima	J. M. Caverly.
Granada	J. L. Lockwood.
Newport	W. G. Shackford.
San Blas	Thos Chapman.
San Jose	D. S. Austin.
Quebec Steamship Company.	
Br. s. s. Muriel	G. S. Locke.
Orinoco	J. S. Garvin.
Red "D" Line.	
Am. s. s. Philadelphia	Sam. Hess.
Valencia	W. Woodrick.
Red Star Line.	
Belg. s. s. Belgenland	W. A. Boynon.
Nederland	A. J. Griffin.
Noordland	H. E. Nickels.
Pennland	Rud. Weyer.
Rhynland	J. C. Jamison.
Switzerland	H. Buschmann.
Waesland	J. Ueberweg.
Westernland	Com. W. G. Randle.
Rotterdam Line.	
Dtch. s. s. Edam	Capt. J. H. Taat
P. Caland	F. H. Bonjer.
Leerdam	G. S. Stenger.
Schiedam	A. Fotjer.
Zaandam	H. v. d. Zee.
Rotterdam	G. V. Vis.
Royal Mail Steamship Co.	
Am. s. s. City of Dallas	C. W. Read.
State Line.	
Br. s. s. State of Georgia	G. Moodie.
State of Indiana	A. Ritchie.
State of Pennsylvania	A. J. A Mann.
State of Nebraska	A. G. Brace.
State of Nevada	J. A. Stewart.
Thingvalla Line.	
Dan. s. s. Geiser	C. W. Müller.
Hekla	A. G. Thomsen.
Island	W. Skjodt.
Thingvalla	S. T. H. Laub.
Twin Screw Line.	
Br. s. s. Richmond Hill	A. Hyde.
Tower Hill	F. Archer, R.N.R.
Ludgate Hill	2d Off. H. Dumaresq.
Tyne and Baltic Steamship Co.	
Br. s. s. City of Newcastle	Capt. R. Townsend.
United States and Brazil Mail S. S. Co.	
Am. s. s. Advance	James Lord.
Alliance	J. R. Beers.
Warren Line.	
Br. s. s. Iowa	Samuel Walters.
Kansas	W. Gleig.
Norseman	E. Maddox.
White Cross Line.	
Belg. s. s. DeRuyter	J. J. Brarens.

Name of vessel.	Captain.
White Cross Line—Continued.	
Belg. s. s. Pieter de Coninck	Capt. E. Smit.
Jan Breydel	H. Meyer.
White Star Line.	
Br. s. s. Adriatic	H. Farrell.
Arabic	G. Burton.
Baltic	H. Davinson.
Britannic	H. Perry.
Celtic	P. J. Irving.
Germanic	Benj. Glendell.
Republic	P. J. Irving.
Wilson Line.	
Br. s. s. Bassano	W. Ros.
Buffalo	J. H. Malet.
Chicago	J. W. Jones.
Galileo	R. T. Jones.
Marengo	W. Abbott.
Otranto	W. Rippeth.
Rialto	F. Kerr.
Salier	B. H. Rogers.
Santiago	R. Potter.
Miscellaneous.	
Nor. s. s. Amicitia	P. M. Reimers
Br. Aguan	J. Adair.
Span. Asturiano	Arribal Seaga.
Br. Benalder	J. Ross.
Ben Ledi	S. Adamson.
Chigwell	W. Masters.
Chillian	E. F. Bannister.
Devonshire	Mate Samuel Winter.
Durham City	Capt. D. D. Galbraith.
Earnmoor	R. J. Grey.
Edith Godden	J. H. Bennett.
Span. Elcano	Y. de Ispizua.
Br Fitzroy	Henry Gibb.
John Dixon	L. C. Welch.
Am. Light-ship No. 37	Andrew Jackson.
Am. Lorenzo D. Baker	Warren F. Wiley.
Br. Lord O'Neill	James Dunn.
Madrid	M. Garson.
Span. Manuel L. Villaverde	Claudio Perales.
Br. Mercia	John Taylor.
Span. Mexico	M. Carmona.
Br. Mozart	T. Sawyer.
Ocean Prince	W. J. Milburn.
Pawnee	John James.
Peconic	G. Evans
Pomona	J. Legoe.
Prydain	M. Parry.
Queen	J. Annison.
Saint Bonans	Henry Campbell.
Span. Serra	F. de Luzarraga.
Br. Surrey	R. Griffiths.
Vertumnus	C. E. Cook.
Wylo	T. L. Rogers.
New York Herald Weather Service.	
Ger. bk. Bremerhaven	A. Witte.
Am. s. s. Caracas	N. M. Hopkins.
Fr. Chateau Lafite	C. Ollivier.
Chateau Marquax	A Sensine.
Am. City of Puebla	John Deaken.
El Monte	J. W. Hawthorn.
El Paso	H. S. Quick.
Knickerbocker	F. Remble.
Br. Marco Aurelio	H. Bermpohl.
Nevada	J. A. B. Cushing.
Am. Niagara	S. V Bennis.
Br. Portia	Henry Dawson.
Am. Rio Grande	J. F. Lewis.
Br. Samana	W. Taylor.
Straits of Gibraltar	G. Grigs.
Trinidad	W. J. Fraser
Sailing vessels.	
Br. bg. Achsah	A. M. Shaw.
Am bk. Alice	W. G. Kair.
Nor. bk. Artemis	E. E. Moe.
Am. bg. Abbie Clifford	D. W. Storer.
Br. Adria	J. H. Weldon.
It. bk. Angelo di Amore	M. Travega.
Am. bg. Arcot	J. W. Cates.
Ger. sp. August	G. H. Jaburg.
Am. bkt Bonny Doon	C. Burgess.
Am. schr. C. B. Church	M A Anderson.
Br. sp. Chas. S. Whitney	Geo. D. Spicer.
Am. schr. Comet	W. A. Aldrich.
Am. bg. Daisy Boynton	C Harding.
Am. schr. Edward R. Emerson	A. H. Child.
Ger. bk. Emilie	W. Siems
Aust. bk. Errante	A. G. Nicolich.
Ger. sp. Ellida	T. H. Zincke.
Nor. sp. Ferdinand	H. Lütken.
It. bk. Fratelli Laurin	L. Laurin.
Nor. Grundloven	O. G. Ellingsen.
Am. Guy C. Goss	Mr. W. O. Weeden.
Nor. Hanna	Capt. S. Falch Muns.
Ger. sp. Hermann	H. Vahland.
Br. bk. Iodine	Adam Smith.
bg. Jane	T. England.
Swed. bk. John Fought	O. Carlsson.
Br. bkt. Josephine	Chas. Brown.
bk. José E. Moro	Asmus Lenhard.
Nor. sp. Komandor Svend Foyn	J. Bryde.
Am. bg. L. & W. Armstrong	A Alexander.
Am. schr. Maggie Abbott	D. C. McIntosh.
bg. Manson	E. T. Page.
Br. bk. Mary	C. Acocks.
Nor. Orion	A. Mathieson.
Ger. sp. Palme	W. Dahls.
Am. bk. Ralph Hayward	J. Baxter.
Ger. bg. Richard	A. von Seggern.
Am. bg. Ruby	A. J von Post.
Sarah	L. R. Hale.
Br. sp. Stephen D. Horton	J. Spicer.
It. bk. Teresa Accame	G. Buetto.
Br. Tiber	D. Keiffe.
Am. Tillie Baker	J. W. Carty.
Rus. Toivo	W. H. Snellman.
Am. bg. Water Witch	Max Knaebel.
Nor. bk Ymer	J. E. Andersen.

UNITED STATES SIGNAL SERVICE

MONTHLY WEATHER REVIEW.

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INTRODUCTION.

This REVIEW treats generally the meteorological conditions of the United States and Canada for May, 1887, and is based upon reports of regular and voluntary observers of both countries. Descriptions of the storms which occurred over the north Atlantic Ocean during the month are also given, and their approximate paths shown on chart i, on which also appears the distribution of icebergs and field ice reported. In tracing the centres of the paths of these storms, data from the reports of two hundred and thirty-three vessels have been used. The weather in the trans-Atlantic routes was seasonable during a greater portion of the month, the severe gales and low barometric pressure which prevailed over mid-ocean from the 22d to the 25th, inclusive, being a noticeable and unusual feature. The position and movement of the Arctic ice-fields corresponded closely with the average for corresponding month of previous years. Dense fog prevailed during a considerable portion of the month in the trans-Atlantic routes west of the fortieth meridian.

On chart i for this month are traced over the United States and Canada the paths of ten areas of low pressure; the average number for May during the past thirteen years is 8.6. The most severe storm of the month passed over the upper Mississippi valley and upper lake region on the 1st and 2d; it was accompanied by heavy thunder-storms and severe south and southwest gales, and followed on the 3d by rapidly falling temperature. The depression that passed northward over Louisiana and Arkansas on the 3d and 4th was accompanied and preceded in those states, and over the adjacent regions, by very heavy rainfalls, a number of stations reporting from two to four inches in forty-eight hours; these rains were of great benefit to this region, in which there had been prolonged drought.

The temperature of the month has been decidedly above the normal in all parts of the country, except along the Atlantic coast and in middle California. The greatest excess over the normal occurred in the Lake region and upper Mississippi valley, where it amounted to from 4° to 8°.

The most important feature in connection with the precipitation of the month has been the marked deficiency in New England, the Lake region, upper Mississippi and Missouri valleys, and east Gulf states, over which districts the deficiencies amounted to from 30 per cent. to 75 per cent. of the average.

In the preparation of this REVIEW the following data, received up to June 20, 1887, have been used, viz., the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and thirty-three Signal Service stations and twenty-three Canadian stations, as telegraphed to this office; one hundred and seventy-one monthly journals and one hundred and sixty-six monthly means from the former and twenty-three monthly means from the latter; two hundred and seventy-one monthly registers from voluntary observers; fifty-nine monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the local weather services of Alabama, Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Mississippi, Missouri, New England, New Jersey, North Carolina, Ohio, South Carolina, and Tennessee; and of the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean pressure for May, 1887, determined from the tri-daily telegraphic observations of the Signal Service, is shown by isobarometric lines on chart ii.

The barometric means for May, 1887, were least in the Rocky Mountain regions and in British America to the north of Montana and Dakota, over which territory they ranged, generally, from 29.8 to 29.9, although means both above and below these figures are reported from scattering stations. At Q'Appelle, Northwest Territory, and Deadwood, Dak., the means were 29.79 and 29.98, respectively, that for Deadwood being about .05 higher than at any station in the region named. To the eastward and westward of the Rocky Mountain regions the mean pressure increases to 30.05 on both the Atlantic and Pacific coasts; while the isobar for 30.05 is traced along the Atlantic coast from Nova Scotia to Virginia, that for 30.05 on the Pacific coast is confined to the limits of Oregon. Over the region from the Great Lakes southward to the Gulf coast the barometric means ranged from 29.95 to 30.00. The highest mean reported during the month is 30.09, at Wood's Holl, Mass., the least being 29.79, at Q'Appelle, as stated above.

The departures from the normal pressure for the various stations are given in the tables of miscellaneous meteorological data; they are also graphically exhibited on chart iv by lines connecting stations of normal or equal abnormal values. A comparison of the mean pressure for May, 1887, with the normal, shows, as will be seen from chart iv, that over the greater part of the country the pressure has differed but slightly from the normal for May. In the middle Rocky Mountain districts, upper Missouri valley, and along the northern border of the United States from Lake Superior to the Pacific coast, the pressure has been below the normal; it has also been slightly below the normal over an area embracing the greater part of the territory south of the Ohio River and east of the Mississippi. In all other districts the pressure has been normal or above. The most marked excess, 0.1, is shown over Manitoba and the Red River Valley of the North; while the greatest deficiency, also 0.1, occurs in the Maritime Provinces of Canada.

The mean pressure for May, 1887, as compared with that for the preceding month, shows a decrease, generally ranging from .01 to .08, in the extreme northwest, the plateau, and

Pacific coast districts, and over the Southern States from New Mexico eastward to the south Atlantic coast, the deficiency being greatest in the Gulf States. Over the eastern slope of the Rocky Mountains, and from the Missouri Valley eastward to the New England coast, the mean pressure for May was greater than that for April, the excess ranging from .01 to .05 over all the regions named, except in New England, where it amounted to from .10 to .15.

BAROMETRIC RANGES.

The monthly barometric ranges at the various Signal Service stations are also given in the table of miscellaneous data. The monthly ranges have been greatest in the extreme northwest and northern Rocky Mountain slope; they have been least, as usual, in the southern districts. The following are some of the extremes:

Greatest.		Least.	
	Inch.		Inch.
Huron, Dak	1.33	Key West, Fla	0.27
Fort Custer, Mont	1.32	San Diego, Cal	0.29
Moorhead, Minn	1.30	Los Angeles, Cal	0.30
Fort Buford, Dak	1.28	New Orleans, La	0.35
Poplar River, Mont	1.27	Galveston, Tex	0.37
Saint Vincent, Minn	1.27	Mobile, Ala	0.42
Yankton, Dak	1.25	Pensacola, Fla	0.43

AREAS OF HIGH PRESSURE.

Six areas of high pressure were observed during the month, but only two of these passed within the limits of the stations of observation, and these were traced from the Pacific to the Atlantic coasts. Four areas of high pressure were first observed on the Pacific coast, and the general movement of these was first to the northeast, and after the centres passed the Coast Range the direction changed to the southeast. But two of these areas of high pressure passed to the east of the Mississippi Valley, and two were first observed north of the Saint Lawrence Valley and extended southward over the Maritime Provinces, New England, and the adjoining states, the direction of movement being generally to the southeastward.

I.—At the 7 a. m. telegraphic report on the 1st of the month this area of high pressure extended over the Pacific coast and plateau regions, the barometer near the centre, on the Oregon coast, being 30.42. The storm in the Missouri Valley extended over the eastern slope of the Rocky Mountains, the barometer being below 29.30 from Colorado northward to northeastern Dakota. A second area of high pressure extended over the middle and south Atlantic coasts, while a second area of low pressure covered Nova Scotia. During the succeeding twenty-four hours the area of high pressure on the Pacific coast passed to the east of the coast line, moving slightly to the north of east, after which it passed to the southeast, crossing the Rocky Mountains during the 2d, being central in eastern Colorado and covering the entire eastern Rocky Mountain slope on the morning of the 3d. During the easterly movement the barometric pressure within this area diminished slightly, and this decrease continued during its transit over the Mississippi Valley. The direction of movement changed to the northeast as it approached the Lake region, over which it was central during the 4th and 5th, but the decrease of pressure continued and the area became less clearly defined until it reached the Maritime Provinces, when the pressure increased to 30.40 and above on the 6th and 7th. After reaching the north Atlantic coast the southeasterly course was again resumed, and it finally disappeared as a well-defined area of high pressure on the 7th.

II.—This area of high pressure appeared north of the Gulf of Saint Lawrence on the 9th and moved southward to the New England coast, where it was central on the morning of the 10th. A portion of this high area apparently moved westward over the Lake region, where it remained during the 11th, 12th, and 13th. It passed slowly to the eastward, attended by northeasterly winds and fair weather over the northeastern portion of the United States, crossing the Saint Lawrence Valley on the 14th and disappearing to the east of Nova Scotia on the 15th.

III.—During the 9th the barometer was high over the Pacific, southwest of California, and an area of low pressure, with considerable energy, was central over the northern plateau region, the low area being trough-shaped and extending southward over Nevada and Utah. During the 10th and 11th the high area moved northward along the Pacific coast, the centre of greatest pressure being in western Oregon on the morning of the 12th, while the area of low pressure previously referred to had moved to the eastern slope of the Rocky Mountains, inclining slightly to the northeast. This high area crossed the Rocky Mountains during the 13th, inclining to the southeast, and was central in eastern Colorado on the morning of the 14th. As it moved eastward a low area was formed over Utah and Colorado, which was apparently forced to the southward, and the low area in the northern portion of the barometric trough previously referred to continued its movement to the northeast. On the morning of the 15th the barometer ranged from .2 to .3 above the normal from the Missouri Valley eastward to the Atlantic coast, and it was from .3 to .4 above the normal to the northward of Montana. There was a general movement to the southeastward from the Saskatchewan Valley to the Missouri Valley during the 16th, 17th, and 18th, when this area covered the entire eastern slope of the Rocky Mountains and central valleys, but with the pressure decreasing from 30.5 to 30.0. It moved directly eastward from the lower Misssuri valley to the Atlantic coast during the 19th and 20th, but the barometric pressure within its limits differed but slightly from the normal until it passed to the east of the coast line, when the pressure again increased. It was apparently extended by the approach of a secondary high area from the Maritime Provinces on the 21st, and was last observed to the east of the middle Atlantic coast on the 23d.

IV.—This high area extended over the north Pacific on the 21st, and apparently moved northeastward beyond the stations of observation. It was apparently to the north of Washington Territory on the morning of the 22d.

V.—This high area appeared on the north Pacific coast on the 24th where it remained almost stationary until the 28th, when it moved slowly to the eastward, reaching Idaho on the 29th and disappearing, by a gradual decrease of pressure, in the upper Missouri valley during the 30th.

VI.—At the close of the month this area of high pressure was apparently moving southeastward over the Maritime Provinces, where it had been first observed on the morning of the 30th.

AREAS OF LOW PRESSURE.

Chart number i exhibits the paths of the low areas traced from the tri-daily weather maps during the month. An examination of this chart will show that the region of greatest storm frequency was to the north of Dakota, and generally in the northern and central Rocky Mountain regions. It will be observed that no well-defined storm reached the Atlantic coast to the south of New England, and that only two were traced over the Mississippi Valley, one of which moved almost directly north and the other to the southward, both disappearing within the limits of observations.

Although ten separate areas of low pressure have been traced on the chart, in some cases these areas have been a part of extended barometric depressions which afterwards united, forming a single disturbance, and in other cases the principal areas have moved to the north of the stations of observation, leaving minor disturbances to the southward which possessed but slight energy and which were not sufficiently defined to be traced as separate areas of low pressure. It may be stated that all areas of low pressure to the west of the Rocky Mountains moved to the north of east; all of those appearing in the extreme northwest moved first to the south of east, and one of these latter changed its course to the northeast while central in the Missouri Valley.

The following table shows the latitude and longitude in which each area of low pressure was first and last observed and the average hourly velocity of each:

Areas of low pressure.	First observed.		Last observed.		Average progress in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	° ′	° ′	° ′	° ′	
No. I	52 00	106 00	53 00	70 00	22.0
II	28 00	99 00	39 00	89 00	14.0
III	50 00	126 00	54 00	104 00	27.0
IV	42 00	115 00	52 00	99 00	27.0
V	41 00	123 00	52 00	104 00	7.0
VI	41 00	108 00	33 00	101 00	13.0
VII	52 00	112 00	43 00	102 00	22.0
VIII	42 00	115 00	42 00	100 00	14.0
IX	53 00	110 00	40 00	70 00	16.0
X	53 00	105 00	39 00	88 00	18.0

Mean hourly progress, 18.0 miles.

I.—This disturbance appeared north of Montana during the latter part of the previous month and passed southward, following the general course of the Missouri Valley, reaching southeastern Dakota on the morning of the 1st. At this point the direction of movement changed more than 90°, the track of the storm at this point forming an acute angle. Previous to the northeasterly movement of this storm its general form was elongated toward the north and south, and after the change of direction it became circular in form and developed great energy while passing over Minnesota and the upper lake region. The barometer fell to its minimum during the 1st, the 3 p. m. report from Yankton and Huron, Dak., being 29.14. Heavy rains and severe storms occurred in Minnesota and adjoining states on the 1st and 2d, during the transit of this low area over that region. The rain-area extended southward over the Mississippi Valley and eastward over the Lake region, but caused no marked change in the weather conditions on the Atlantic coast and from the Lake region southward to the east Gulf coast, owing to the rapid movement of this disturbance to the northward. It was apparently central north of Lake Superior at 10 p. m. of the 2d, after which its centre could only be approximately located, but it apparently inclined more to the eastward after passing to the north of the Lake region.

The following special reports relate to this storm:

Yankton, Dak.: light rain fell during the night of the 1st–2d, and from 10 to 11 a. m. of the 2d. High northerly wind blew all day; maximum velocity, forty miles per hour.

Sturgeon Bay, Wis.: during a severe gale on the 2d the schooner "Consuelo" was driven ashore at Bailey's Harbor.

Milwaukee, Wis.: a storm of considerable violence prevailed at this place, and other portions of the state, on the 2d. During the day the wind blew at the rate of from thirty to forty miles per hour in Milwaukee, causing damage to cornices, signs, etc., in different parts of the city.

Marquette, Mich.: a strong southwest wind set in at 2.15 a. m. of the 1st and continued until 3.13 a. m., at a velocity of twenty-four miles per hour. Between 1.52 and 6.38 p. m. it again blew from the south with the force of a gale. On the 2d high south and southwest winds prevailed, with thunderstorm and heavy rain in the afternoon. From reports received up to the 7th it was shown that the storm of the 2d was unusually severe in thirteen counties of the upper Michigan peninsula. Great damage was done to the pine forests, and many buildings were destroyed. It was estimated that the damage done in the upper peninsula would reach $100,000.

Muskegon, Mich.: the signal displayman at this station states that a severe gale prevailed on the 2d, attaining an estimated velocity of fifty miles per hour. During the storm the flagstaff used for the display of signals was blown down.

Iron River, Iron Co., Mich.: during the 2d a severe wind storm prevailed at this place. Trees were blown down and considerable light damage done to buildings, etc. The storm was reported to have been severe at Quinnesec and Florence also.

Mackinaw City, Mich.: the early morning of the 2d was cloudy, with falling barometer. Light rain fell from 8.50 to 10.30 a. m.; at 7.40 a. m. an easterly gale set in. At 3.40 p. m. the wind suddenly shifted to the south and blew a heavy gale, at the same time the temperature rose very rapidly, reaching 82°.7 at 3.50 p. m., a rise of 40°.0 in fifty minutes. A number of light buildings were blown down, and several vessels passed through the straits with part of their rigging gone.

Escanaba, Mich.: at 1.40 p. m. of the 2d a southerly gale, having an average velocity of twenty-six miles per hour, set in and continued until after midnight. During the afternoon the wind veered to the southwest and increased in velocity. On the 3d the weather was threatening and cloudy. Telegraph lines were damaged by the gale, interrupting communication for sixteen hours.

Grand Haven, Mich.: on the 2d brisk to high southerly winds, with cloudy weather, prevailed during the greater part of the day. The 3d was decidedly colder, a fall in temperature of 26°.2 occurring, with decreasing southwest winds.

Keokuk, Iowa: the morning of the 1st was clear with wind backing from south to southeast, increasing to gale at 3 p. m., and between 5.45 and 6.25 p. m. blowing at the rate of fifty miles per hour. Light rain fell from 8.25 to 8.40 p. m. During the day several thunder-storms passed west of the station. The gale subsided at 9 p. m., wind veering to south. Temperature high, barometer low and falling slowly. On the night of the 1st–2d the wind was brisk and veering toward the southwest, increasing to a gale at 10 a. m., and veering to west; highest velocity thirty miles per hour at 2.30 p. m. Gale ended at 5 p. m., wind backing to southwest. The temperature fell steadily during the day and the barometer rose rapidly.

Jefferson City, Mo.: a violent wind storm occurred at this place on the 2d, unroofing the Lahman Opera House and a number of other buildings in the city. Considerable damage was done to orchards and fences in the surrounding country.

Erie, Pa.: on the 2d the wind blew hard from the south until 7.30 p. m., when it suddenly changed to the west and blew with increased velocity.

II.—This disturbance developed in the lower Rio Grande valley, where its centre was approximately located on the morning of the 2d. By midnight of the 3d it had reached the west Gulf coast, attended by much needed rains in that locality. It moved northeastward, following the coast line, to southern Louisiana, after which it moved directly northward to southern Missouri, causing heavy rains in the lower Mississippi valley as far northward as Missouri. After reaching southwestern Missouri the course changed to the northeastward, and it was last observed as central in northeastern Illinois at midnight of the 5th, attended by general rains in the Lake region and upper Mississippi and Ohio valleys. The barometer continued low in the central valleys during the 4th, when minor disturbances were observed to the westward of the Alleghenies, but the disturbance disappeared by a gradual increase of pressure, and this disappearance was probably due to the advance of an extended barometric trough, which was at that time moving eastward from the northern Rocky Mountain region.

III.—This low area appeared on the Pacific coast north of Washington Territory on the 2d, but was at no time central within the limits of observation. It passed eastward over the Rocky Mountains during the 3d, remaining almost stationary far to the north of Montana during the twenty-four hours from midnight of the 2d to midnight of the 3d. It finally disappeared, apparently moving slightly to the north of east, and was last observed on the morning of the 4th.

IV.—The 7 a. m. telegraphic report of the 6th indicated the presence of this area of low pressure, covering the plateau regions and central in northern Nevada, the barometer being low to the north of Oregon and in Minnesota. The succeeding reports received during the 6th indicated that this area was extending and increasing in energy. At midnight of the 6th the barometer had fallen to 29.24, near the centre in Montana, and it was generally below 29.5 from Colorado and New Mexico northward to the Canadian stations. This barometric trough moved slowly eastward, while the centre of greatest pressure moved to the northeastward during the 7th, and it was last observed as central north of Minnesota at midnight of that date, although secondary depressions formed in the Missouri Valley and in northern Texas, which disappeared without causing marked changes in the atmospheric conditions. This storm was attended by very high winds in the upper Missouri valley and at western Canadian stations during the 7th, and it was also followed by severe gales on the north Pacific coast on the same date, these latter gales being due to an area of low pressure which is not traced on chart number i, as the track of its centre could not be determined from the reports received.

V.—This area of low pressure was central in California on the morning of the 9th. It moved northeastward, attended by rains on the coast as far south as San Francisco, and was followed by cold northwest winds and light snows and freezing weather over the central plateau regions. The centre of least

pressure crossed the Rocky Mountains near the northern boundary during the night of the 9th and continued its northeasterly course during the 10th, leaving a barometric trough to the southward, within which afterwards developed the storm traced as number vi. The pressure continued low in the region north of Dakota and Minnesota until the 14th, without any apparent easterly movement of this area, and it was finally replaced by an increase of pressure from the Pacific coast due to the advance of high area described as number iii.

VI.—This depression formed in the southern portion of the barometric trough traced as number v. It extended over the central Rocky Mountain region on the 11th, being central in the eastern part of Utah. It passed eastward over Colorado during the 11th and 12th, and on the morning of the 13th it extended from Texas northward over Minnesota, causing local rains in the states of the Mississippi and Missouri valleys. The advance of an area of high pressure from the Rocky Mountain regions apparently caused the formation of two areas of low pressure, one central north of Minnesota and the other in eastern New Mexico, both of which were replaced by the extension of the high area previously referred to.

VII and VIII.—On the 18th the barometric pressure was unusually low over the plateau regions and north of Montana, where on the afternoon of that day this area of low pressure (vii) was first located. During several days preceding there had apparently been a gradual decrease of barometric pressure, extending along the Pacific coast from Arizona and southern California and to the eastward of the Coast Range. This northerly movement continued over the plateau region while an area of high pressure passed southeastward over the Rocky Mountains, and although this disturbance is not traced to the southward it probably resulted from the conditions above named. It moved southeastward, crossing the Rocky Mountains near the northern boundary during the 18th; on the 19th it passed eastward over Dakota, number viii developing in the southern portion of the barometric trough central in Nevada on the same day. The latter moved eastward over Colorado on the 19th, and the two united on the 20th, remaining almost stationary in eastern Colorado and western Nebraska until the afternoon of the 21st, when two secondary areas again formed—one passing northeastward over Lake Superior, and the other passing southward and disappearing quickly by a gradual increase of pressure, due to the advance of an area of high pressure from the Rocky Mountain region.

IX.—This is the only storm of the month which was traced to the Atlantic coast. It was first observed north of Montana on the 22d, and moved southeastward to Lake Superior, where it was central on the 24th, attended by local rains throughout the Northern States. From Lake Superior it moved eastward during the 24th and 25th, and its centre could only be approximately located. After reaching the Saint Lawrence Valley an area of low pressure developed on the New England coast and continued almost stationary over that region until the 28th, when the centre of disturbance was east of the coast line, apparently south of Boston.

When this disturbance was first observed in the extreme northwest on the 23d, a second area of low pressure, possessing but slight energy, but accompanied by very heavy rains, extended over Florida and the south Atlantic coast. This second disturbance was quite well defined in that region during the 23d, but it was not considered of sufficient importance to be traced on chart number i.

X.—This low area appeared far to the north of Montana on the 28th, moving first to the southeastward and then to the southward, causing general rains in the central valleys and on the Atlantic coast. This low area apparently moved from western Lake Superior southward to Illinois, where the centre was last located on the afternoon of the 31st.

NORTH ATLANTIC STORMS DURING MAY, 1887.

[*Pressure in inches and millimetres; wind-force by Beaufort scale.*]

The paths of the depressions that have appeared over the north Atlantic Ocean during the month are determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and other data collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports received through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the proprietors of the "New York Maritime Register," and from other miscellaneous data received at this office up to June 21, 1887.

Eleven depressions are traced, of which two traversed the ocean from coast to coast; one originated over the Caribbean Sea and moved northward over Cuba; one first appeared south of Bermuda and advanced slowly northward; one passed southward from the American coast, in about N. 41°, and subsequently circled northeast; four developed to the southward or southeastward of Nova Scotia and Newfoundland; one is first charted northeast of Newfoundland, and two are first traced within the region of observation in European waters, one having advanced from the southwest and the other from the northwest. The general direction of movement of the depressions was east-northeast to the eastward of the fortieth meridian, while to the westward of that longitude the tracks were greatly diversified as regards position and direction.

The general character of the weather over the north Atlantic Ocean was seasonable, and the depressions which appeared within the region of observation were rather evenly distributed throughout the month. Storms of marked violence were not reported until the 10th, although previous to this date four depressions appeared, two of which passed from Newfoundland to the European coast, their tracks being well to the northward of the trans-Atlantic routes; one pursued an irregular course southeast of Newfoundland, and one prevailed during the 2d to the southward of the British Isles. From the 10th to the 13th strong south to west gales were encountered to the eastward and southeastward of Newfoundland. From the 15th to the 20th unsettled and stormy weather prevailed from Bermuda to Jamaica, while on the 19th strong west to north gales were experienced to the southward of the British Isles. The severest storms of the month occurred over mid-ocean from the 22d to 25th, inclusive, with barometric pressure ranging below 29.00 (736.6). From the 26th to the 28th, inclusive, very heavy thunder-storms, accompanied by heavy rain, prevailed over the ocean south of Nova Scotia, and on the 28th strong to whole gales were reported in the vicinity of the Azores. During the first ten days of the month the barometric pressure fluctuated over the entire ocean, but continued relatively high in the vicinity of the Azores until the 7th when an appreciable fall, followed after the 8th by a rapid rise, in barometer occurred in that region. From the 10th to the 22d the pressure continued high over mid-ocean, after which a period of low barometric pressure continued over, and to the northward of, the Azores until the 29th. The month ended with an area of high barometer to the southward and southeastward of the Banks of Newfoundland; elsewhere the pressure was about normal.

For May, 1886, ten depressions were traced, of which one traversed the ocean from coast to coast. The positions of the tracks were, as in May, 1887, greatly diversified, and their general direction was east-northeast. In no instance were pressures below 29.00 (736.6) reported.

As compared with the corresponding month of previous

years, the depressions which appeared during May, 1887, correspond closely with the average as regards number, position, and direction of movement. The storms were not, as a rule, of exceptional strength, and the severe disturbances which prevailed over mid-ocean from the 22d to the 25th, inclusive, attending the passage of depressions numbers 8 and 9, constitute a noticeable feature of the month.

The following are brief descriptions of the depressions traced:

1.—This depression was central on the 1st over the west portion of the Gulf of Saint Lawrence, whence it followed the normal east-northeast track to the northwestward of Scotland by the 7th. The depression had moderate strength throughout, but passed too far to the northward to cause strong disturbances in the trans-Atlantic routes.

2.—This depression apparently advanced northeast to the vicinity of the French coast, in N. 48°, by the 2d, after which it passed beyond the region of observation; while exhibiting considerable depth, this depression was unaccompanied by gales of marked strength over the ocean.

3.—This depression first appeared over the ocean southeast of Nova Scotia on the 2d, and moved slowly southeast by the 3d; by the 4th the storm-centre had circled westward to the sixty-fourth meridian, whence it passed northeast to Newfoundland by the 5th. During the next three days it pursued an east-northeast course to the northwestward of the British Isles. The depression had slight depth throughout and occasioned gales of but moderate strength.

4.—This depression is first charted in N. 37°, W. 46° under date of the 7th, whence it moved slowly east by the 8th, after which it was deflected northward by an area of high pressure overlying the Azores. From the 9th to the 13th, inclusive, it pursued an irregular course over the ocean east of Newfoundland and thence passed northward beyond the region of observation. The depression was of moderate strength and exhibited barometric minima ranging to about 29.50 (749.3) on the 10th.

The following reports of shipmasters refer to gales encountered within the area of this depression: Capt. M. P. Lund, of the s. s. "Katie," reports a strong s. to w. gale on the 9th and 10th; lowest barometer, 29.51 (749.5), at 4 a. m. of the 10th, in N. 46° 30′, W. 39° 00′. Capt. W. Skjodt, of the s. s. "Island," reports a fresh nw. to w. gale during the 11th and 12th; lowest barometer, 29.65 (753.1), at 4 p. m. of the 12th, in N. 40° 26′, W. 54° 30′.

5.—This depression was central on the 15th to the southward of Bermuda, with fresh to strong gales and rain over a considerable area to the northward. By the 16th the centre of depression had moved to the northwest of Bermuda, with central pressure about 29.60 (751.8). Passing slowly northward the storm disappeared north of Newfoundland during the 20th, an area of high barometer over the ocean opposing an eastward course.

The following report shows the character of the disturbances which attended the passage of this depression over Bermuda: Capt. James S. Garvin, of the s. s. "Orinoco," reports: "15th, at Bermuda; in a. m. very heavy rain, falling barometer, fresh nne. gale; 8 p. m., barometer 29.57 (751.1), fresh se. gale, heavy rain and thunder. 16th, 6 a. m., barometer 29.55 (750.6), fresh s. gale, heavy rain; 10 a. m., wind sse., rain; noon, heavy s. gale, barometer 29.45 (748.0); midnight, barometer 29.55 (750.6), fresh sw. gales. 17th, in a. m., fresh sw. wind, rising barometer; in p. m., fine weather."

6.—Vessel reports of the 17th indicated the presence of a cyclonic centre to the westward of Jamaica; moving slowly north the depression is traced to the south coast of Cuba, in W. 79°, by the 18th, whence it passed north over that island by the 19th. During the 20th and 21st the centre of depression advanced eastward to the seventy-first meridian, after which it disappeared. The passage of this depression was chiefly characterized by heavy rain, although the wind was heavy, in gusts, and barometric pressure 29.60 (751.8) was reported on the 18th.

The following reports relative to this storm have been rendered: Mr. James Mainwaring, observer on the s. s. "Athos," Capt. Horatio Low, commanding, reports: "17th, off the southeast end of Jamaica; weather very dark and thick, with torrents of rain, vivid lightning, and strong gusts of wind from se.; continued very squally and unsettled, with heavy rain, until the 18th." Capt. John Legoc, of the s. s. "Pomona," reports: "17–18th, in Montego Bay, Jamaica; very heavy rain, wind from sw., in heavy, short squalls, making a bad sea at times; at night very dark; lowest barometer, 29.71 (754.6), on the 18th. This was an unusually heavy wind for Jamaica, for the time of year." Second Officer Sengzelius, of the s. s. "Alvena," Captain Mackay, commanding, reports: "17th, from Kingston to Lucea, Jamaica, experienced very rough weather after leaving Port Royal at 10 a. m., Greenwich mean time. 18th, the wind commenced to blow from the southward, with heavy rain squalls, and increased in strength up to 4 p. m., during which time the wind hauled to the westward and a heavy sea was running from sw.; the barometer (mercurial) being down to 29.60 (751.8) at the last-mentioned hour. After 4 p. m. the wind and squalls decreased in strength, but wind continued to blow strong from the westward." The s. s. "Athos," on the 20th, in N. 26° 13′, W. 74° 12′, encountered an easterly gale, accompanied with heavy rain squalls lasting twelve hours; lowest barometer 29.85 (758.2).

7.—This storm advanced southeast over the ocean west of Ireland by the 19th, and thence passed eastward beyond the region of marine reports. The depression was accompanied by strong gales and rain to the thirty-fifth meridian on the 19th.

Capt. R. Griffiths, of the s. s. "Surrey," reports, relative to this depression: "19th, in N. 49° 13′, W. 9° 40′, at noon, experienced a strong gale from wnw., commencing at 13 hours; the sea ran very high until noon of the 20th, in N. 49° 58′, W. 4° 05′, the ship at that time being well sheltered under the English coast; the wind gradually moderated, with occasional heavy nw. squalls, the last passing over at 9 p. m.; lowest barometer, 29.69 (754.1), at 14 hours 45 minutes on the 19th."

8.—While it is probable that this depression was a continuation of ocean storm number v, an absence of reports from the region west and north of Newfoundland will not admit of connecting the tracks. Considered as a separate storm, this depression appeared within the region of observation, in N. 51°, W. 43° on the 22d, and, moving southeast, with barometric pressure below 29.50 (749.3), it united with depression number ix on the 23d.

The following report refers to this depression: Capt. Milburn, of the s. s. "British Prince," reports a gale on the 22d, in N. 48° 09′, W. 37° 33′, at noon. The gale was accompanied by a very bad sea, and ship was hove to; barometer fell to 29.48 (748.8) at 6 hours 35 minutes, when wind suddenly shifted to nw. in a very heavy shower.

9.—This depression was central on the 23d in N. 38°, W. 53° whence it had apparently advanced from the southwestward, and, while the course of direction held by depression number vi on the 21st would allow of its possible continuation to the position given number ix for the 22d, the large extent of intervening territory sparsely covered by reports will not admit of accurately tracing number vi subsequent to the 21st. Following the junction of numbers viii and ix on the 23d a depression of great energy, accompanied by the severest disturbances of the month, moved slowly northward along the west margin of an area of high pressure which occupied the British Isles and the ocean to the westward, and disappeared north of the fifty-fifth parallel after the 25th.

The following are reports descriptive of disturbances experienced within the area of this depression:

Capt. A. McRitchie, of the s. s. "Australia," reports: "22d, in N. 40° 23′, W. 30° 42′, at noon; at 1.30 p. m. wind increased to strong gale, steady from s., with heavy, threatening weather. 23d, 5.30 a. m., gale blowing force 11, with tremendous sea from s.; had to keep ship's head to wind and sea seven hours; position at noon, N. 40° 16′, W. 34° 47′; 1 p. m., wind and sea

moderated; barometer 29.43 (747.5); wind veered to wsw. and at 4 p. m. to nw., moderating in shift and afterwards increasing to strong nw. gale, with heavy squalls and high cross seas from sw., w., and nw." Third Officer J. E. Peterson, of the s. s. "Aurania," Capt. W. H. P. Haines, commanding, reports: "24th, noon, Greenwich mean time, in N. 49° 47′, W. 26° 42′, strong breeze increasing to a moderate gale and backing from s. to sse. and se., with high sea rising; 16 hours 49 minutes, in N. 48° 29′, W. 32° 18′, barometer 28.92 (734.6) (lowest); wind fell light and then shifted to w. and blew a strong gale with confused sea. Gale moderated during the 25th, with sea running from wnw. and nw."

Capt. S. Nowell, of the s. s. "British Prince," reports a fresh gale from the 22d to 24th; wind veered from s. to nnw.; lowest barometer, 29.55 (750.6), at noon of the 24th, in N. 45° 45′, W. 35° 18′. Capt. W. A. Griffiths, of the s. s. "Spain," reports: "25th, in N. 47° 47′, W. 30° 52′, experienced a sudden shift of wind from sse. to nw., during a squall of hurricane force; barometer 28.80 (731.5). Capt. James Dunn, of the s. s. "Lord O'Neill," reports a strong sw. to sse. gale on the 24th and 25th; lowest barometer, 29.67 (753.6), at 11 a. m. of the 24th, in N. 49° 05′, W. 28° 07′.

10.—This depression was central on the 26th to the northward of the Azores, whence it had advanced from the southwestward. By the 29th the storm-centre had moved eastward to the vicinity of the French coast. Strong to whole gales accompanied this depression, and, subsequent to the 27th, the area of high pressure over, and to the eastward of, the Azores gave way to the southwestward and allowed the storm to pursue an easterly course to the European coast.

The following reports relative to this depression have been rendered by shipmasters: Capt. James Ross, of the s. s. "Benalder," reports: "26th, wind increased suddenly to force 8 from the north and continued about two hours; at 6 p. m., in N. 47° 10′, W. 27° 40′, wind moderated and barometer read 29.25 (742.9). After 6 p. m. the barometer commenced to rise and wind backed from n. to w. and sw. and freshened to force 6, then backed gradually to se., with barometer rising steadily until 8 p. m. of the 27th, when it suddenly increased to force 8 and continued four hours, with rising barometer, then had moderate, steady, easterly winds to the English coast." Capt. G. J. Mills, of the s. s. "Kings' Cross," reports a whole gale on the 27th and 28th; wind veered from w. to s. to nnw.; lowest barometer, 29.50 (749.3), at noon of the 28th, in N. 38° 58′, W. 26° 40′.

11.—This depression passed southward from the American coast, in about N. 42°, on the 28th, to the thirty-eighth parallel by the 29th, and thence circled northeast to the vicinity of Nova Scotia by the 30th, after which it apparently moved eastward south of Newfoundland. The depression was relatively shallow and was unaccompanied by disturbances of marked strength.

OCEAN ICE.

On chart i are also exhibited the limits within which icebergs and field ice were reported during May, 1887. These limits are determined from reports furnished by shipmasters, and from data collected by the Signal Service agencies.

During this month the easternmost and southernmost ice reported was a quantity of field ice passed on the 20th, in N. 39° 38′, W. 46° 00′, by the s. s. "Amoor." Ice was most frequently reported over and off the southern edge of the Banks of Newfoundland. Heavy ice was encountered from Cape Saint Francis to Cape Mary, and off Sydney and Cow bays, and in the Gut of Canso, and a number of vessels were damaged in those localities. Captain Mitchell, of the s. s. "Invermay," reports having encountered heavy ice in the Gut of Canso, and arrived at Pictou on the 10th, having been delayed three days in the Gut. Captain Grigs, of the s. s. "Straits of Gibraltar," reports that on the 13th a large quantity of field ice was packed about Sydney and Cow bays, and that steamers bound to those places were delayed at Louisburg. Mr. J. Higgins, observer at Saint John's, Newfoundland, reports that on the 30th and 31st a large iceberg floated across the Narrows.

Compared with the chart for the preceding month, April, 1887, the eastern limit of ice is about eight degrees further west, and the southern limit about one-half degree further south. The aggregate number of icebergs reported over and off the southern edge of the Banks, and off the east and southeast coasts of Newfoundland, correspond closely with that reported during April, while in the vicinity of Cape Breton there was a marked increase in the quantity of field ice.

Compared with the chart for May, 1886, the eastern limit of ice is shown to be about the same, while the southern limit is extended about two degrees.

Compared with the corresponding month of previous years the southward movement of ice in the vicinity of Newfoundland during May, 1887, did not differ materially from the average.

The following table shows the southern and eastern limits of the region within which ice was reported for May during the last five years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Lon. W.	Month.	Lat. N.	Lon. W.
	° ′	° ′		° ′	° ′
May, 1883	40 30	47 00	May, 1883	45 40	45 12
May, 1884	41 30	47 30	May, 1884	43 30	44 50
May, 1885	40 50	48 15	May, 1885	42 30	40 10
May, 1886	41 36	51 30	May, 1886	48 55	46 13
May, 1887	39 38	46 00	May, 1887	39 38	46 00

Icebergs and field ice were reported as follows:

Date.	Vessels.	Position. Lat. N.	Position. Lon. W.	Remarks.
		° ′	° ′	
1	S. S. De Ruyter	43 02	51 22	One berg.
	S. S. Taormina	43 30	48 04	One large and five small bergs.
	S. S. Winnipeg	Saint Paul to Cape Race.		Large ice field.
	S. S. Beethoven	45 00	49 to 51	Six large bergs.
	S. S. Gothenburg City	46 40	48 00	One large berg.
2	S. S. Ethiopia	44 04	49 18	One small berg.
		44 02	49 25	Do.
	S. S. Istrian	43 43	49 23	One large berg.
	S. S. Azalea	42 50	51 00	Do.
	S. S. Gothenburg City	46 33	48 24	Do.
3	S. S. Peruvian	In fairway of Saint John's channel.		Do.
4	S. S. Albano	47 20	48 08	Do.
5	S. S. Peruvian	Saint John's to Cape Ballard.		Numerous large bergs.
	Bk. Lovold	44 00	47 30	Three large bergs.
	Bk. Holden	44 00	47 50	Do.
6	S. S. Grecian	42 20	51 00	One berg.
7	S. S. Wyoming	42 10	51 44	One large berg.
	Sp. Cape of Good Hope	42 12	01 21	Pieces of field ice.
	S. S. Germanic	42 19	51 53	One large berg.
8	S. S. State of Nebraska	43 14	50 18	A medium sized berg.
	Bk. Aurora	42 40	50 25	One large berg.
9	do	42 23	51 34	Do.
10	S. S. Edam	41 35	51 05	Do.
	S. S. Schiedam	42 11	50 41	Two bergs.
12	S. S. Venetian	43 55	48 45	One large berg.
	S. S. Austrian	45 36	49 21	One berg.
13	S. S. Arizona	42 51	48 44	Three large bergs.
		42 28	49 50	
	Bk. Amoor	41 30	47 40	Two enormous bergs.
	S. S. Fulda	44 51	48 59	One large berg.
		44 22	49 18	Do.
	S. S. Katie	43 44	52 30	One berg.
	S. S. Devonia	53 07	49 23	Two small bergs.
	S. S. Buenos Ayrean	43 03	48 18	One large berg.
	S. S. Sarmatian	46 02	51 54	One small berg and pieces.
14	S. S. Corean	47 29	48 36	One very large berg.
	S. S. Buenos Ayrean	Cape Race to Cape Saint Mary's.		Large bergs.
15	S. S. Corean	46 50	50 40	Two large bergs.
	S. S. Fulda	44 51	48 59	One large berg.
16	S. S. Gleniffer	43 24	49 00	Do
		46 50	50 40	Four very large bergs.
	S. S. Washington City	46 09	58 48	Large quantities of floating ice.
17	S. S. Schiedam	42 08	50 15	One large and one moderate berg.
	S. S. Celtic	42 20	50 33	Two medium bergs.
	S. S. Washington City	46 05	59 10	Vast quantities of field ice.
	S. S. Caspian	47 55	47 13	One large berg.
		Off Saint John's...		Two bergs.
18	S. S. Saale	42 16	50 16	One small berg.
	S. S. Slavonia	42 05	50 22	One berg.
	S. S. Caspian	Off Saint John's Harbor.		Two large bergs.
19	S. S. Arabic	42 24	50 14	One small berg.
		42 25	50 30	One piece of ice.
	S. S. Furnessia	43 14	47 57	One medium berg.
	S. S. Etruria	42 15	50 13	One small berg.
		42 19	50 26	Do.
	S. S. Donau	43 16	47 38	One large berg.
		42 27	49 26	One small berg.

Icebergs and field ice—Continued.

Date.	Vessel.	Position. Lat. N.	Position. Lon. W.	Remarks.
		° ′	° ′	
20	S. S. Washington City	Off Cape coast.	Breton	Large quantities of floating ice.
	S. S. Amoor	39 38	46 00	Field ice.
21	S. S. Gothenburg City	46 40	48 00	One large berg.
		46 33	48 24	Do.
22	S. S. Rotterdam	42 57	49 18	Do.
		42 10	49 54	Do.
		42 39	51 15	Do.
	S. S. State of Georgia	42 55	50 05	Do.
23	S. S. Bavarian	42 40	50 30	Two large bergs.
	S. S. Scandinavian	42 41	50 05	One berg.
24	S. S. Aller	43 20	46 21	One large berg.
		42 23	49 36	One medium berg.
	S. S. Indian Prince	42 24	51 06	One large iceberg.
25	S. S. Washington City	Cape Breton coast		Large fields.
	S. S. Suevia	42 34	50 41	Two bergs.
	S. S. Republic	43 27	48 53	One moderate berg.
	S. S. Aller	42 14	50 35	One medium berg.
28	S. S. Borderer	42 50	51 00	One berg.
	S. S. Sarnia	Off Cape Race		
29	S. S. Grecian	47 24	49 45	One small berg.
30	do	Off Cape Pine		One large berg.
	Bk. Adolph	do		Do.

FOG.

From the following reports it will be seen that fog-banks were encountered in the vicinity of the Banks of Newfoundland on sixteen dates, and in the trans-Atlantic routes to the westward of the sixtieth meridian on nineteen dates. In each of the thirty-four instances in which fog was observed in the vicinity of the Banks, the position of the reporting vessel was included within the eastern quadrants of an area of low barometric pressure. As regards fog observed to the westward of the sixtieth meridian, forty-one reports have been made, by which it is shown that fog was, as a rule, encountered in the western quadrants of areas of low pressure, or within areas of high barometer which succeeded the eastward passage of cyclonic areas.

The following table shows the limits of fog-areas on the north Atlantic Ocean during May, 1887, as reported by shipmasters:

Date.	Vessel.	Entered. Lat. N.	Entered. Lon. W.	Entered. Time.	Cleared. Lat. N.	Cleared. Lon. W.	Cleared. Time.
		° ′	° ′		° ′	° ′	
1	S. S. Waesland	42 59	41 41		42 51	42 02	
3	S. S. Lessing	42 02	50 20		42 02	50 30	
		41 57	51 34		41 49	53 26	
3	S. S. State of Indiana	41 45	51 47		41 41	53 56	
3–4	S. S. Adriatic	43 13	48 52		42 09	55 47	
3–5	S. S. Baltic	45 56	45 12		42 34	54 11	
4	S. S. State of Indiana	40 59	64 30		40 57	64 50	
4	S. S. Waesland	40 10	64 22		40 15	66 27	
5	S. S. Lessing	41 40	64 15		40 49	64 36	
		40 53	65 40		40 59	65 55	
8	S. S. Umbria	43 15	47 02		42 10	50 06	
		42 02	51 00		42 00	51 20	

Limits of fog areas—Continued.

Date.	Vessel	Entered. Lat. N.	Entered. Lon. W.	Entered. Time.	Cleared. Lat. N.	Cleared. Lon. W.	Cleared. Time.
		° ′	° ′		° ′	° ′	
5	S. S. Waesland	40 28	69 23		40 28	69 39	
7	S. S. Eider	41 23	65 15		Sandy	Hook.	
7–8	S. S. New Orleans	Lower	Bay, N.	Y.	Till 3 a.	m.	
8	S. S. Elysia	39 55	67 57		Scotland	light-ship.	
8	S. S. Aurania	Sandy	Hook		40 10	65 44	
8–9–10	S. S. Denmark	Dense	fog cont	inued off Sa	ndy Ho	ok.	
8–9	S. S. Rugia	New Y	ork.		40 28	66 31	
9	S. S. British Princess	39 12	69 41		39 23	66 14	
9	S. S. Britannic	46 53	42 31		46 30	43 45	
10–11	S. S. City of Augusta	40 00	74 00		37 50	75 00	
12	S. S. British Princess	40 46	48 44		40 51	48 22	
14 16	S. S. Washington City	45 56	50 29		46 09	58 00	
15	S. S. Gleniffer	44 40	45 30	9 a. m. to 3	p. m.		
15–17	do	44 00	47 30		42 36	51 40	
16	S. S. LaBretagne	43 45	45 45		42 18	50 20	
16–17	S. S. Schiedam	44 50	43 30		42 10	50 05	
16–20	S. S. Washington City	46 09	59 00		Scatari,	C. B.	
16–17	S. S. Celtic	44 52	45 11	9-35 p. m.	42 35	50 33	4.45 p. m.
16	S. S. Rialto	40 00	47 10		39 58	47 40	
16–17	S. S. Pavonia	42 27	46 45	4.55 p. m.	41 55	48 47	6.19 a. m.
16–17	S. S. British King	44 00	39 50		43 34	40 55	
16–23	S. S. Toledo	46 58	42 12		39 20	74 10	
17	S. S. Denmark	40 25	67 44		40 23	65 27	
17–19	S. S. Santiago	41 35	63 00		Boston		
17	S. S. Eider	41 39	50 08		42 38	47 41	
17	S. S. Saale	42 40	47 15		42 20	50 00	
17	S. S. Benalder	40 20	67 50		40 20	65 00	
17	S. S. Rhaetia	44 10	41 05		43 10	43 28	
17	S. S. British King	42 42	43 00		43 00	43 15	
17–18	S. S. Weser	39 20	66 14	5.35 a. m.	37 40	74 03	9 a. m.
17–19	S. S. Wyoming	40 28	73 00	8 p. m	41 10	63 00	8 a. m.
18	S. S. Letimbro	37 41	72 45		38 30	73 06	
18	S. S. City of Montreal	41 00	65 10		Fire Island.		
18	Schr. C. B Church	43 20	70 03		42 35	70 15	
19	S. S. Trave	40 30	70 31		40 16	64 40	
19	S. S. Edith Godden	38 26	74 18		38 57	74 15	
19	S. S. Gleniffer	41 20	61 00		40 55	65 00	
19–20	S. S. Schiedam	41 40	61 36		41 00	66 14	
19–20	S. S. Rialto	40 20	63 00		40 25	66 30	
19–20	S. S. Celtic	41 11	63 15	8.10 a. m.	40 44	66 56	7.20 a. m.
19–20	S. S. Marengo	40 28	64 56	8. p. m.	40 35	66 50	7.30 a. m.
20	S. S. Rhaetia	41 30	58 28		41 28	58 44	
20	S. S. City of Augusta	39 00	75 00		36 30	75 20	
21	S. S. Rhaetia	41 17	62 42		41 17	63 30	
21–22	S. S. British King	39 15	70 30		10° W. of	5-fathom	light-ship.
22–23	S. S. Gleniffer	39 50	69 50		39 30	72 10	
22	S. S. Rialto	40 30	72 00		Sandy	Hook.	
22–23	S. S. Albers	38 59	72 38		40 07	73 25	
23	Schr. C. B. Church	39 41	71 53		39 40	72 10	
23	S. S. Rotterdam	40 28	71 30		40 28	71 25	
24	do	40 28	67 00		40 34	64 00	
24–26	S. S. Arabic	41 43	54 54		44 11	44 29	At inter-vals.
25	S. S. La Bourgogne	40 56	66 33		Montauk.		
25	S. S. Rotterdam	40 51	69 09		40 26	72 56	
25	S. S. Suevia	42 20	53 13		42 17	53 30	
26–27	S. S. Aurania	44 00	46 00		42 30	52 00	
26–27	S. S. British Prince	41 43	46 55		41 02	48 18	
27–28	S. S. Suevia	41 12	63 45		40 50	70 00	
28	S. S. Westernland	41 40	46 47		40 50	48 37	
28	S. S. Vaderland	41 30	46 04		40 25	48 54	
28–30	S. S. Canada	42 53	40 15		41 00	48 30	
29	S. S. Galileo	40 32	66 42		40 32	68 13	
29	S. S. Aurania	41 12	63 48		41 00	66 12	
29	S. S. Polynesia	40 30	44 09		41 19	44 44	
30	do	40 38	46 33		40 31	47 15	
30–31	S. S. Ems	45 05	41 59		42 13	51 02	
30–31	S. S. British Princess	43 47	41 19		43 24	42 09	

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for May, 1887, is exhibited on chart ii by the dotted isothermal lines. In the table of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service, and in the figures opposite the names of the geographical districts in the column for mean temperature, precipitation, and departures from the normal, show respectively the averages for the several districts. The normal for any district may be found by adding the departure to the current mean for the district when the departure is below the normal, and subtracting when above. On chart iv the departures from the normal are illustrated by lines connecting stations of normal or equal abnormal values.

In northern California, western Montana, New Mexico, along the immediate Gulf coast, and on the south Atlantic coast below Charleston, S. C., including the Florida Peninsula, the month of May, 1887, was slightly colder than the average, the most marked deficiency in the mean temperature occurring at Key West, Fla. With the exception of the comparatively small areas above mentioned, the month was warmer than the average throughout the United States. For the entire country north of the thirty-fifth parallel, the excess in the mean temperature amounted to 2°, or more, with the exception of the Pacific coast, northern New England, and the Maritime Provinces of Canada; to the northward of the parallel mentioned the departures increase to 6°, or more, over portions of the Lake region, Saint Lawrence, upper Mississippi, and lower Missouri valleys, while the area over which the excess amounts to 4° embraces all territory from Dakota and Nebraska eastward to Maine.

RANGES OF TEMPERATURE.

The monthly, and the greatest and least daily, ranges of

temperature, are given in the table of miscellaneous meteorological data.

In the extreme northwest, and over the central and northern Rocky Mountain districts, the monthly ranges were generally from 60° to 70°, the greatest, 79°.1, occurring at Winnemucca, Nev. The lower Ohio and central Mississippi valleys, and along the Atlantic and Gulf coasts, are the regions over which the monthly ranges were least, being generally below 40°. At Tatoosh Island, Wash., and San Diego, Cal., the monthly ranges were 32°.6 and 31°.5, respectively, all other Pacific stations reporting ranges of 40°, or more.

The following are some of the greatest and least monthly ranges at Signal Service stations:

Greatest.	°	Least.	°
Winnemucca, Nev	79.1	Key West, Fla	16.6
Fort Klamath, Oregon	75.0	Pensacola, Fla	27.4
Ashland, Oregon	74.0	New Orleans, La	28.8
Fort Bidwell, Cal	72.6	Galveston, Tex	29.8
Lake View, Oregon	72.5	San Diego, Cal	31.5
Boisé City, Idaho	71.2	Atlanta, Ga	31.6
Saint Vincent, Minn	71.2	Mobile, Ala	32.1

The greatest daily ranges of temperature during the month were 40°, or more, over the plateau districts, eastern Rocky Mountain slope, and in Wisconsin, Minnesota, and Dakota, occurring generally from the 3d to 5th, 9th, 17th, and 18th. Over the central and eastern portions of the country the greatest daily ranges occurred on the 1st, 2d, 4th to 6th, 9th, 10th, and from the 15th to 20th, and they generally exceeded 30°, except at the Atlantic coast stations south of New England, where they were from 20° to 30°; they were also from 20° to 30° in the Southern States.

The least daily ranges exceeded 10° over the region from the lower Ohio valley southward to the Gulf, and in all districts to the west of the one hundredth meridian, except along the immediate coast of the Pacific and over portions of the northern plateau and northern slope. In southern Florida, and at stations on the Atlantic coast north of Virginia, the least daily ranges were less than 5°.

The following are some of the most marked departures from the normal temperature at Signal Service stations:

Above normal.	°	Below normal.	°
Buffalo, N. Y	8.6	Key West, Fla	2.5
Parry Sound, Ontario	8.2	Brownsville, Tex	1.9
Marquette, Mich	7.8	Savannah, Ga	1.5
Dubuque, Iowa	7.6	Jacksonville, Fla	1.4
Huron, Dak	7.1	San Francisco, Cal	1.2
Montreal, Quebec	7.0	Cedar Keys, Fla	1.1
Kingston, Ontario	6.7	Sanford, Fla	1.1

The Signal Service observer at San Francisco, Cal., reports, relative to the unusually high temperature at that place on the 28th, as follows:

The temperature (maximum, 96°.9, at 3.30 p. m.) to-day is the highest recorded in this city since the opening of the station in 1871, and is 1°.7 higher than that of June 6, 1883. The records kept in this city by the late Henry Gibbon, sr., since 1850, show only two instances where the temperature exceeded that of to-day, viz., September 10th and 11, 1852, when the mercury reached 97°.0 and 98°.0 on the two days respectively, when the "air was as a 'sirocco,' causing the woodwork of houses to cackle audibly and the plaster to break on the wooden walls."

DEVIATIONS FROM NORMAL TEMPERATURES.

In the table below are given, for certain stations, as reported by voluntary observers, the normal temperatures of May for a series of years, the mean temperature for May, 1887, and the departures from the normal:

Station.	County.	Normal temperature for May.	Number of years.	Mean temperature for May, 1887.	Departure.
Arkansas.		°		°	°
Lead Hill	Boone	67.7	5	70.7	+ 3.0
California.					
Sacramento	Sacramento	64.4	21	63.0	− 1.4

Deviations from normal temperatures—Continued.

Station.	County.	Normal temperature for May.	Number of years.	Mean temperature for May, 1887.	Departure.
Connecticut.		°		°	°
Middletown *	Middlesex	57.1	29	61.2	+ 4.1
New Haven *	New Haven	57.4	101	60.5	+ 3.1
Thompson *	Windham	56.5	30	60.1	+ 3.6
Waterbury *	New Haven	58.0	12	61.2	+ 3.2
Dakota.					
Webster	Day	57.1	5	61.2	+ 4.1
Illinois.					
Mattoon	Coles	62.7	7	66.0	+ 3.3
Peoria	Peoria	64.5	32	71.1	+ 6.6
Riley	McHenry	56.6	26	62.9	+ 6.3
Sycamore	De Kalb	58.6	7	63.5	+ 4.9
Indiana.					
Lafayette	Tippecanoe	62.2	8	65.5	+ 3.3
Logansport	Cass	64.0	33	69.0	+ 5.0
Vevay	Switzerland	65.4	21	68.6	+ 3.2
Iowa.					
Clinton	Clinton	59.9	9	66.6	+ 6.7
Cresco	Howard	58.0	10	59.0	+ 1.0
Monticello	Jones	59.8	34	65.1	+ 5.3
Muscatine	Muscatine	59.8	49	65.0	+ 5.2
Kansas.					
Independence	Montgomery	66.5	16	68.8	+ 2.3
Lawrence	Douglas	65.3	19	67.9	+ 2.6
Wellington	Sumner	65.1	9	69.1	+ 4.0
Yates Centre	Woodson	64.0	7	67.6	+ 3.6
Maine.					
Belfast *	Waldo	52.1	28	55.3	+ 3.2
Cornish	York	55.2	30	58.6	+ 3.4
Gardiner *	Kennebec	53.5	51	55.7	+ 2.2
Orono *	Penobscot	52.5	19	55.9	+ 3.4
Maryland.					
Cumberland	Alleghany	61.9	15	65.8	+ 3.9
Fallston	Harford	60.7	16	64.6	+ 3.9
New Midway	Frederick	64.9	6	70.9	+ 6.0
Massachusetts.					
Amherst *	Hampshire	56.9	50	63.8	+ 6.9
Cambridge *	Middlesex	56.1	65	60.0	+ 3.9
Fitchburg *	Worcester	55.3	31	60.0	+ 4.7
New Bedford *	Bristol	54.7	75	57.5	+ 2.8
Somerset	Bristol	58.2	17	62.0	+ 3.8
Springfield *	Hampden	59.2	20	64.3	+ 5.1
Taunton *	Bristol	58.6	16	58.7	+ 0.1
Williamstown *	Berkshire	56.7	30	61.2	+ 4.5
Nevada.					
Carson City	Ormsby	57.3	8	58.7	+ 1.4
New Brunswick.					
Saint John *	Saint John	47.1	27	48.3	+ 1.2
New Hampshire.					
Concord *	Merrimac	57.0	19	61.4	+ 4.4
Hanover *	Grafton	55.7	23	59.6	+ 3.9
New Jersey.					
Dover	Morris	57.4	5	61.7	+ 4.3
South Orange	Essex	60.4	17	60.4	0.0
New York.					
Factoryville	Tioga	57.4	5	65.8	+ 8.4
North Volney	Oswego	55.3	20	61.8	+ 6.5
Palermo	Oswego	53.9	34	60.2	+ 6.3
Ohio.					
Wauseon	Fulton	58.8	17	63.2	+ 4.4
Pennsylvania.					
Dyberry	Wayne	55.0	21	61.3	+ 6.3
South Carolina.					
Stateburg	Sumter	70.2	7	70.9	+ 0.7
Texas.					
New Ulm	Austin	74.5	15	75.1	+ 0.6
Vermont.					
Lunenburg *	Essex	52.5	38	59.4	+ 6.9
Newport *	Orleans	56.3	13	61.6	+ 5.3
Strafford	Orange	56.6	13	63.0	+ 6.4
Virginia.					
Bird's Nest	Northampton	67.0	19	68.8	+ 1.8
Dale Enterprise	Rockingham	62.7	7	72.0	+ 9.3
Variety Mills	Nelson	63.6	10	66.4	+ 2.8
Wytheville	Wythe	61.1	24	65.3	+ 4.2
West Virginia.					
Helvetia	Randolph	58.1	10	63.2	+ 5.1

* From the "Bulletin of the New England Meteorological Society."

In connection with this subject, the following notes are furnished by voluntary observers:

Arkansas.—Lead Hill, Boone Co.: the mean temperature for the spring of 1887 is 62°.0, which is 3°.1 above the mean of the past five years.

Illinois.—Peoria, Peoria Co.: the mean temperature of May, 1887, is 71°.1; this is the highest mean, with one exception, viz., 71°.4 in 1881, that is shown by the record of thirty-two years' observations.

Riley, McHenry Co.: during the last twenty-six years the mean temperature for May, 1887, 62°.9, has been exceeded in but three instances, viz., in 1870, 1880, and 1881. The mean temperature of the spring of 1887, 46°.2, is 2°.6 above the mean for the same period; only the years 1863, 1870, 1871, 1878, and 1880 were warmer.

Indiana.—Lafayette, Tippecanoe Co.: the highest mean temperature for May during the past eight years, 69°.4, occurred in 1881, the lowest mean temperature, 55°.1, in 1882; the highest maximum temperature for the same period, 94°.0, occurred in 1881, and the lowest minimum temperature, 32°.0, in 1880.

Logansport, Cass Co.: during the last thirty-three years the highest maxi-

mum temperature for May, 99°.0, occurred in 1881; the lowest minimum temperature, 28°.0, in 1876 and 1878.

Vevay, Switzerland Co.: comparisons of temperature for the month of May, 1887, with the May means of the past twenty-one years: the maximum temperature, 90°.0, on the 20th, is 3°.4 above the mean maximum; the minimum temperature, 48°.0, on the 27th, is 6°.5 above the mean minimum; the range of temperature, 42°.0, is 3°.1 below the average range.

Iowa.—Monticello, Jones Co.: during the past thirty-four years the highest mean temperature for May, 67°.8, occurred in 1870, the lowest mean temperature, 52°.1, in 1860; the highest maximum temperature for the same period, 95°.0, occurred in 1856, the lowest minimum temperature, 25°.0, in 1885.

Kansas.—Independence, Montgomery Co.: the mean temperature for the spring of 1887, 59°.0, is 2°.8 above the average for the last sixteen years.

Wellington, Sumner Co.: during the last nine years the highest mean temperature, 71°.2, occurred in 1880, the lowest mean temperature, 58°.2, in 1882; the highest temperature for the same period, 97°.0, occurred in 1879, the lowest temperature, 32°.0, in 1885.

Yates Centre, Woodson Co.: the mean temperature for May, 1887, 67°.6, is, with one exception, 68°.9 in 1886, the warmest May during the last eight years.

Maine.—Cornish, York Co.: during the last thirty years the warmest May occurred in 1879, mean temperature, 59°.0; the coldest occurred in 1861, mean temperature, 49°.2.

Gardiner, Kennebec Co.: the maximum temperature for May, 1887, is 88°.0; only twice in fifty-one years has the maximum temperature been higher, viz., 89°.0 in 1840, and 90°.0 in 1863.

Maryland.—Cumberland, Alleghany Co.: temperature table for May of the last fifteen years:

Year.	Highest.	Lowest.	Mean.	Year.	Highest.	Lowest.	Mean.
	°	°	°		°	°	°
1873	83.0	44.0	61.0	1882	78.0	36.0	57.5
1874	89.0	42.0	62.0	1883	84.0	42.0	62.5
1875	85.0	41.0	63.0	1884	85.0	40.0	61.0
1876	82.0	36.0	62.0	1885	82.0	40.0	60.0
1877	86.0	38.0	59.5	1886	80.0	40.0	62.0
1878	82.0	42.0	59.0	1887	91.0	50.0	65.8
1879	88.0	34.0	62.0				
1880	90.0	40.0	67.0	Average	85.0	40.3	61.9
1881	89.0	40.0	65.0				

Fallston, Harford Co.: the mean temperature for May, 1887, 64°.6, is the highest May mean, with one exception, viz., 67°.5 in 1880, that has occurred during the last sixteen years; the lowest mean temperature in that time was 55°.4, in 1882.

New Jersey.—South Orange, Essex Co.: the mean temperature for the season just closed, 47°.7, is 0°.3 above the average for the last seventeen years.

New York.—North Volney, Oswego Co.: during the past twenty years the highest mean temperature for May, 62°.4, occurred in 1880; the lowest mean temperature, 50°.2, in 1882.

Palermo, Oswego Co.: during the past thirty-four years the highest mean temperature for May, 60°.7, occurred in 1880; the lowest mean temperature, 47°.5, in 1867. The mean temperature of the spring of 1887, 45°.6, is 3°.7 above the average for the same period.

Ohio.—Wauseon, Fulton Co.: the mean temperature for May, 1887, 68°.2, is 4°.4 above the average for the last seventeen years, and is the warmest May since 1881; the lowest mean, 52°.2, occurred in 1882. The mean temperature of the spring of 1887, 47°.0, is 1°.2 above the average for the same period; the extreme temperatures for May are 103°.2 in 1874, and 21°.0 in 1885.

Pennsylvania—Dyberry, Wayne Co.: during the past twenty-one years the highest mean temperature for May, 64°.1, occurred in 1880; the lowest mean temperature, 48°.4, in 1882.

South Carolina.—Stateburg, Sumter Co.: during the last seven years the highest mean temperature for May, 73°.8, occurred in 1881, and the lowest mean temperature, 65°.9, in 1885.

Texas.—New Ulm, Austin Co.: the highest mean temperature during the last fifteen years, 77°.4, occurred in 1879, the lowest mean temperature, 72°.0, in 1885; the highest maximum temperature in that time, 98°.0, occurred in 1874, the lowest minimum, 46°.0, in 1876. The mean temperature for the spring of 1887 (March, April, and May), 69°.4, is 0°.8 above the average for the same number of years; the highest mean temperature for the spring in that time, 72°.0, occurred in 1873; the lowest mean temperature, 66°.4, in 1885.

Vermont.—Strafford, Orange Co.: the mean temperature for May, 1887, 63°.0, is the highest observed during the last thirteen years; the lowest mean temperature for the same period, 50°.5, occurred in 1882.

Virginia.—Variety Mills, Nelson Co.: during ten years past the highest mean temperature, 68°.0, occurred in 1880; the lowest mean temperature, 62°.0, in 1877.

West Virginia.—Helvetia, Randolph Co.: the mean temperature for May, 1887, 63°.2, is the highest, with one exception, viz., in 1880 (which shows a similar average), that is shown by the record of ten years' observations; the lowest mean temperature in that time, 53°.4, occurred in 1877.

Table of comparative maximum and minimum temperatures for May.

State or Territory.	Station.	For 1887.		Since establishment of station.			
		Max.	Min.	Max.	Year.	Min.	Year.
		°	°	°		°	
Alabama	Mobile	91.7	56.4	98.0	1878	47.3	1883
Do	Montgomery	92.1	60.0	98.0	1875	44.0	1883
Arizona	Yuma	103.5	44.5	110.0	1885	48.9	1884
Do	Fort Grant	89.1	77.8	94.1	1885	37.0	1882
Arkansas	Fort Smith	91.8	50.0	97.9	1886	41.5	1885
Do	Little Rock	89.0	52.0	93.2	1886	43.8	1885
California	Los Angeles	92.0	44.5	100.0	1883	39.5	1883
Do	San Francisco	96.9	45.6	86.0	1883	45.0	1876, 1879, 1880, 1882
Colorado	Denver	89.4	30.9	92.0	1874	27.0	1872, 1873
Do	Pike's Peak	44.3	— 1.8	47.0	1880	— 8.0	1875
Connecticut	New Haven	85.6	41.7	89.0	1880	30.5	1882
Dakota	Bismarck	90.6	25.7	92.0	1880	21.0	1875
Do	Deadwood	80.2	30.9	86.0	1886	17.3	1885
District of Columbia	Washington City	88.7	50.2	96.0	1880	33.5	1876
Florida	Cedar Keys	86.7	57.0	91.0	1880	50.0	1883
Do	Pensacola	89.5	62.1	93.0	1881	46.6	1883
Georgia	Augusta	93.9	45.9	100.0	1878	42.0	1877
Idaho	Boisé City	97.3	26.1	91.2	1886	26.4	1886
Illinois	Springfield	86.0	48.3	88.0	1881	33.9	1883
Do	Chicago	85.7	42.3	89.0	1874	27.0	1875
Indiana	Indianapolis	89.0	49.0	89.0	1881, 1874	31.0	1877
Indian Territory	Fort Sill	93.0	41.5	103.5	1886	42.0	1885
Iowa	Des Moines	93.4	39.0	93.6	1886	27.8	1885
Do	Davenport	90.0	44.2	90.0	1874	29.0	1875
Kansas	Dodge City	95.0	35.3	98.0	1879, 1880	32.0	1884
Do	Leavenworth	89.6	45.0	94.0	1874	31.0	1875
Kentucky	Louisville	90.3	53.9	93.0	1881	36.0	1875, 1876
Louisiana	New Orleans	90.9	62.1	92.0	1877	56.0	1871, 1877
Do	Shreveport	98.9	52.9	101.2	1886	47.0	1876, 1877
Maine	Eastport	74.0	36.5	80.0	1877	29.0	1882
Do	Portland	80.8	41.0	94.0	1880	34.0	1876
Maryland	Baltimore	86.7	51.2	95.0	1881	34.0	1876
Massachusetts	Boston	89.3	44.7	97.0	1880	31.0	1882
Michigan	Grand Haven	84.0	42.1	86.0	1877	28.0	1885
Do	Marquette	87.9	32.8	92.0	1879	22.0	1875
Minnesota	Saint Vincent	96.0	24.8	85.1	1884	21.0	1882
Do	Moorhead	95.5	25.1	88.0	1881	21.4	1885
Mississippi	Vicksburg	90.6	58.1	95.0	1877, 1874	46.0	1877
Missouri	Saint Louis	89.0	51.1	93.0	1874	32.0	1875
Montana	Fort Assinaboine	91.9	28.6	94.7	1886	18.2	1885
Do	Helena	88.1	30.7	88.8	1886	21.9	1885
Nebraska	North Platte	92.7	30.6	94.0	1880	28.6	1885
Do	Omaha	93.0	39.2	92.9	1886	28.0	1875
Nevada	Winnemucca	95.9	16.8	88.1	1886	19.5	1886
New Hampshire	Mount Washington	62.0	15.5	62.0	1879, 1880	— 1.4	1885
New Jersey	Atlantic City	73.3	46.7	89.0	'77, '80, '81	33.0	1876, 1880
New Mexico	Santa Fé	81.0	24.0	89.0	1872	24.0	1880
New York	Rochester	86.1	39.7	90.0	1879	28.0	1880
Do	Oswego	86.9	42.8	94.0	1879	27.6	1885
North Carolina	Charlotte	90.9	50.4	94.4	1881	40.5	1883
Do	Hatteras	78.2	55.3	88.0	1881	47.0	1882
Ohio	Columbus	89.6	49.5	92.0	1881	34.0	1883
Do	Toledo	90.9	46.4	95.0	1871	30.0	1876
Oregon	Portland	99.0	34.2	94.0	1885	33.0	1878
Do	Roseburg	102.0	31.7	89.2	1886	30.5	1886
Pennsylvania	Erie	86.0	43.2	91.0	1879	30.6	1885
Do	Philadelphia	87.9	48.7	96.0	1880	36.0	1880
Rhode Island	Block Island	77.4	43.8	78.3	1881	36.0	1882
South Carolina	Charleston	88.8	55.1	94.0	1878, 1886	47.0	1876
Tennessee	Chattanooga	90.0	52.8	93.0	1879	41.0	1879
Do	Memphis	90.5	54.0	96.0	1879	41.0	1883
Texas	Brownsville	91.4	56.2	99.0	1877	49.0	1877
Do	El Paso	97.0	41.0	105.1	1886	39.5	1884
Utah	Salt Lake City	93.3	30.7	92.5	1886	31.9	1886
Virginia	Lynchburg	94.1	47.0	94.0	1877	37.0	1876
Do	Norfolk	92.0	49.5	98.0	1880	38.0	1876
Washington Ter	Olympia	88.8	31.5	87.7	1885	30.0	1882, 1886
Do	Spokane Falls	94.9	30.0	88.8	1884	29.0	1881
Wisconsin	La Crosse	91.3	40.4	96.0	1874	29.0	1875
Do	Milwaukee	80.1	41.7	90.0	1874	25.0	1875
Wyoming	Cheyenne	84.0	23.8	88.0	1874	21.5	1886

FROSTS.

Frosts occurred in the various states and territories during the month as follows:

Arizona.—Fort Apache, 3d, 14th.

California.—Sacramento, 7th, 10th; Nicolaus and Willows, 10th; Oroville, 10th, 11th; Fort Bidwell, 10th to 12th; Eureka, 11th.

Colorado.—Denver, 1st, 3d, 5th; Fort Lewis, 1st to 7th, 11th to 13th, 19th to 21st; Las Animas, 3d; Montrose, 3d, 8th, 13th to 15th, 21st; Pike's Peak, 15th, 28th.

Connecticut.—North Colebrook, 1st; Voluntown, 13th.

Dakota.—Deadwood, 1st; Yankton, 2d to 5th; Parkston, 3d; Webster, 3d, 15th, 17th; Bismarck, 3d, 16th, 17th, 24th; Fort Totten, 3d, 17th.

Iowa.—Bancroft, 3d, 18th; Des Moines, 3d, 8th, 25th; Cresco, 17th; Independence, 18th.

Kansas.—Allison, 1st to 3d; Belleville, 3d.

Louisiana.—Liberty Hill, 4th.

Maine.—Orono, 2d.

Massachusetts.—Taunton, 13th, 14th; Amherst and Westborough, 14th.

Michigan.—Mackinaw City, 4th; Escanaba and Marquette, 4th, 6th; Kalamazoo, 4th, 7th, 27th; Traverse City, 27th; Port Huron, 29th.

Minnesota.—Saint Vincent, 3d, 16th, 17th, 25th; Moorhead, 17th.

Montana.—Poplar River, 8th, 16th; Helena, 14th, 16th, 17th, 21st, 22d; Fort Custer, 17th.

Nebraska.—Tecumseh and North Platte, 3d; Valentine, 3d, 14th, 21st; De Soto, 3d, 18th; Fairbury, 4th.

Nevada.—Carson City, 1st, 2d, 7th, 10th to 14th, 17th, 19th, 23d; Winnemucca, 7th, 11th, 12th. The frost at Carson City on the 1st killed most of the fruit and tender vegetables.

New Hampshire.—Mount Washington, 13th; Nashua, 13th, 14th.

New Jersey.—Clayton, Dover, and Roseland, 14th.

New Mexico.—Fort Stanton, 3d, 5th.

New York.—Penn Yan, 12th, 13th; Albany, 12th to 14th; Oswego, 13th; Palermo, 13th, 14th; Humphrey and North Volney, 14th.

Oregon.—Lakeview, 1st, 2d, 7th, 11th; Linkville, 1st, 7th, 10th to 12th, 20th; Fort Klamath, 1st, 4th, 11th to 13th; Bandon, 2d; Albany and Eola, 11th; Mount Angel, 11th, 12th; East Portland, 11th, 12th, 24th; Ashland, Roseburg, and Portland, 12th.

Pennsylvania.—Wellsborough, 1st, 12th, 14th, 15th; Dyberry, 13th to 15th.

Vermont.—Northfield, 2d, 14th, 15th.

Washington Territory.—Spokane Falls, 7th; Olympia, 9th, 11th, 12th; Port Angeles, 9th, 11th to 13th; Walla Walla, 12th.

West Virginia.—Middlebrook, 29th.

Wisconsin.—Fond du Lac, 4th, 18th; Embarras, 26th.

Wyoming.—Fort Bridger, 2d, 3d, 5th, 12th, 13th; Cheyenne, 3d.

ICE.

Ice formed in the various parts of the country during May as follows:

California.—Fort Bidwell, 10th to 12th.

Colorado.—Montrose, 14th.

Dakota.—Fort Totten, 3d, 4th.

Nebraska.—Tecumseh, 3d; Fairbury, 4th.

TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature, as observed at the harbors of the several stations; the monthly range of water temperature; the average depth at which the observations were made, and the mean temperature of the air:

Temperature of water for May, 1887.

Station	Temperature at bottom.				Mean temperature of the air at station.	Average depth of water, feet and tenths.
	Max.	Min.	Range.	Monthly mean.		
	°	°	°	°	°	
Cedar Keys, Fla	78.5	67.9	10.6	75.6	74.9	8.3
Charleston, S. C	77.1	69.4	7.7	74.7	72.7	36.6
Eastport, Me	42.9	38.0	4.9	40.3	48.1	13.6
Galveston, Tex	82.5	73.7	8.8	78.0	75.9	14.4
Key West, Fla	85.7	77.0	8.7	81.9	77.5	21.1
New London, Conn	55.7	45.0	10.7	50.6	58.3	11.5
New York City	63.2	47.0	16.2	57.1	62.9	15.2
Pensacola, Fla	80.6	74.4	6.2	77.2	75.5	17.7
Portland, Me	51.8	42.6	9.3	47.6	55.7	16.8

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for May, 1887, as determined from the reports of about seven hundred stations, is exhibited on chart iii. In the table of miscellaneous meteorological data are given, for each Signal Service station, the total precipitation, with the departures from the normal. The figures opposite the names of the geographical districts in columns for mean temperature, precipitation, and departures from the normal, show respectively the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal, and subtracting when above.

While over certain areas of comparatively limited extent there has been during May, 1887, precipitation in excess of the average, over much the greater part of the country it was deficient. Especially was this the case in New England, the Lake region, the lower portions of the Ohio and Missouri valleys, the upper and central portions of the Mississippi Valley, and the east Gulf states, in which districts, as a whole, there was not more than 60 per cent. of the average amount of rainfall; that for New England amounting to only about 30 per cent. of the average, and for the other districts named the deficiencies amount to from 25 to 50 per cent. In California there was less than one-half of the average rainfall for May.

The rainfall was in excess of the average in the following districts, viz., over an area extending from eastern Ohio and western Pennsylvania southward to eastern Tennessee; in northern Florida; along the south Atlantic coast from Charleston, S. C., to Wilmington, N. C.; along the west Gulf coast and over a region extending from the lower Mississippi River northwestward to, and including portions of, Kansas, Colorado, and New Mexico; along the northern border of the country from western Lake Superior to Manitoba; over portions of the southern plateau; and from the north Pacific coast eastward to western Montana. The excess in the districts named is, in general, slight, the only exceptions being northern Florida, the north Pacific coast, eastern Tennessee, and western Pennsylvania, where it was quite marked, the rainfall on the north Pacific coast being about double the average for the month.

The following are some of the most marked departures from the normal precipitation at Signal Service stations:

Above normal.		Below normal.	
	Inches.		*Inches.*
Astoria, Oregon	4.52	Block Island, R. I	4.25
Tatoosh Island, Wash	4.40	Omaha, Nebr	3.56
Olympia, Wash	3.13	New Haven, Conn	3.36
Jacksonville, Fla	3.05	Springfield, Ill	3.22
Pittsburg, Pa	2.93	Yankton, Dak	3.17
Chattanooga, Tenn	2.56	Des Moines, Iowa	3.03
Portland, Oregon	2.33	Escanaba, Mich	3.02

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows, for certain stations, as reported by voluntary observers, the average precipitation for the month of May for a series of years, the precipitation for May 1887, and the departures from the average:

Station.	County.	Average precipitation for May.	Number of years.	Precipitation for May, 1887.	Departure.
Arkansas.		*Inches.*		*Inches.*	*Inches.*
Lead Hill	Boone	6.08	5	8.57	+ 2.49
California.					
Sacramento	Sacramento	0.50	21	trace.	− 0.50
Connecticut.					
Canton *	Hartford	4.38	26	0.51	− 3.87
Hartford*	Hartford	3.09	16	0.10	− 2.99
Middletown *	Middlesex	3.65	29	0.22	− 3.43
Wallingford *	New Haven	4.14	30	0.25	− 3.89
Dakota.					
Webster	Day	6.18	4	1.72	− 4.46

Deviations from average precipitation—Continued.

Station.	County.	Average precipitation for May.	Number of years.	Precipitation for May, 1887.	Departure
		Inches.		*Inches.*	*Inches.*
Illinois.					
Mattoon	Coles	5.10	7	4.70	− 0.40
Peoria	Peoria	3.75	32	1.24	− 2.51
Riley	McHenry	3.34	26	0.95	− 2.39
Sycamore	De Kalb	3.70	7	0.95	− 2.75
Indiana.					
Lafayette	Tippecanoe	4.79	8	2.11	− 2.68
Logansport	Cass	3.83	33	3.90	+ 0.07
Vevay	Switzerland	3.45	21	3.99	+ 0.54
Iowa.					
Cresco	Howard	3.38	15	0.88	− 2.50
Monticello	Jones	3.85	34	2.72	− 1.13
Muscatine	Muscatine	4.41	40	2.26	− 2.15
Kansas.					
Independence	Montgomery	4.25	15	3.61	− 0.64
Lawrence	Douglas	4.31	19	1.12	− 3.19
Wellington	Sumner	4.83	9	3.21	− 1.62
Yates Centre	Woodson	5.07	7	2.47	− 2.60
Maine.					
Cornish	York	2.97	30	2.13	− 0.84
Gardiner *	Kennebec	3.85	49	1.08	− 2.77
Orono *	Penobscot	3.33	19	1.25	− 2.08
Maryland.					
Cumberland	Alleghany	2.77	15	5.64	+ 2.87
Fallston	Harford	3.45	16	2.51	− 0.94
New Midway	Frederick	4.83	6	6.12	+ 1.29
Massachusetts.					
Amherst *	Hampshire	3.85	52	0.75	− 3.10
Cambridge *	Middlesex	3.57	46	1.70	− 1.87
Chestnut Hill *	Middlesex	2.82	12	1.69	− 1.13
Framingham *	Middlesex	2.88	13	1.11	− 1.77
Lake Cochituate *	Middlesex	3.87	36	0.98	− 2.89
Ludlow *	Hampden	2.88	12	0.85	− 2.03
Lynn *	Essex	3.06	13	1.69	− 1.37
Mystic Lake *	Middlesex	2.79	12	1.75	− 1.04
New Bedford *	Bristol	3.94	74	2.24	− 1.70
Somerset	Bristol	3.29	17	3.12	− 0.17
Springfield *	Hampden	4.14	40	1.02	− 3.12
Waltham *	Middlesex	3.54	63	1.62	− 1.92
Williamstown *	Berkshire	2.80	19	1.31	− 1.49
Nevada.					
Carson City	Ormsby	0.31	8	0.46	+ 0.15
New Brunswick.					
Saint John *	Saint John	4.38	27	2.08	− 2.30
New Hampshire.					
Concord *	Merrimac	3.18	32	1.27	− 1.91
Hanover *	Grafton	2.61	22	3.55	+ 0.94
New Jersey.					
Dover	Morris	3.49	3	2.93	− 0.56
South Orange	Essex	2.83	17	0.93	− 1.90
New York.					
Factoryville	Tioga	2.77	5	1.33	− 1.44
Palermo	Oswego	2.69	34	1.85	− 0.84
Ohio.					
Wauseon	Fulton	4.00	15	3.50	− 0.50
Pennsylvania.					
Dyberry	Wayne	2.77	17	2.62	− 0.15
South Carolina.					
Kirkwood	Kershaw	3.02	20	2.14	− 0.88
Stateburg	Sumter	3.19	7	3.63	+ 0.44
Texas.					
New Ulm	Austin	5.70	15	3.56	− 2.14
Vermont.					
Lunenburg *	Essex	3.61	38	2.23	− 1.38
Newport	Orleans	3.79	13	1.40	− 2.39
Strafford *	Orange	2.98	13	2.20	− 0.78
Virginia.					
Bird's Nest	Northampton	3.12	19	2.80	− 0.32
Dale Enterprise	Rockingham	4.90	7	6.54	+ 1.64
Variety Mills	Nelson	3.93	8	5.34	+ 1.41
Wytheville	Wythe	3.66	24	3.68	+ 0.02
West Virginia.					
Helvetia	Randolph	4.59	10	3.65	− 0.94

* From the "Bulletin of the New England Meteorological Society."

The following notes on precipitation are furnished by the voluntary observers:

Arkansas.—Lead Hill, Boone Co.: the total precipitation for the spring of 1887, 14.43, is 1.23 above the average for the past five years.

Illinois.—Riley, McHenry Co.: the total precipitation for May, 1887, is 0.95; this is the smallest May precipitation for a period of twenty-six years, with two exceptions, viz., 1870 and 1877. The total precipitation for the spring of 1887, 3.51, is the smallest amount recorded during any spring for the last twenty-six years, and is 5.15 less than the average for the same period.

Indiana.—Lafayette, Tippecanoe, Co.: the total precipitation for the month of May, 2.11, is 3.68 below the average for a term of eight years, and is the least recorded in any May during that time.

Logansport, Cass Co.: the greatest precipitation for May during the last thirty-three years, 8.24, occurred in 1880; the least, 1.20, in 1862.

Vevay, Switzerland Co.: during the last twenty-one years the greatest precipitation, 11.80, occurred in 1865; the least in that time, 0.52, in 1874.

Iowa.—Monticello, Jones Co.: the greatest precipitation for May during the last thirty-four years, 7.97, occurred in 1858; the least, 0.76, in 1874.

Kansas.—Independence, Montgomery Co.: the total precipitation for the spring of 1887, 9.02, is 1.08 below the average for the last fifteen years.

Lawrence, Douglas Co.: the total precipitation for the first five months of 1887, 10.01, is 2.14 below the average for the same months in the preceding nineteen years.

Wellington, Sumner Co.: the greatest precipitation for May during the last nine years, 9.37, occurred in 1881; the least, 0.88, in 1886.

Yates Centre, Woodson, Co.: the total precipitation for May, 1887, 2.47, is, with one exception, viz., 1.35 in 1884, the smallest May precipitation recorded during the last seven years.

Maine.—Gardiner, Kennebec Co.: the total precipitation for May, 1887, is 1.08; only twice in fifty-one years has the precipitation for May been less, viz., in 1852 and 1860.

Maryland.—Cumberland, Alleghany Co.: the precipitation for May in the past fifteen years is shown in the following table:

Year.	Precipitation.	Year.	Precipitation.
	Inches.		*Inches.*
1873	4.20	1882	3.80
1874	1.50	1883	4.73
1875	0.30	1884	5.33
1876	1.60	1885	2.58
1877	1.90	1886	3.62
1878	1.70	1887	5.64
1879	1.10		
1880	2.34	Average	2.77
1881	1.29		

Fallston, Harford Co.: during the last sixteen years the greatest precipitation for May, 8.25, occurred in 1886; the least, 0.70, in 1875.

New Midway, Frederick Co.: the greatest precipitation for May during the last six years, 9.75, occurred in 1886; the least, 2.37, in 1883.

New Jersey.—South Orange, Essex Co.: the total precipitation for the spring of 1887, 5.66, is 3.76 below the average for the last seventeen years.

New York.—Palermo, Oswego Co.: during the last thirty-four years the greatest precipitation for May, 6.90, occurred in 1867; the least, 0.30, in 1870. The total precipitation for the spring of 1887, 4.05, is 3.07 below the average for the same period.

Ohio.—Wauseon, Fulton Co.: the largest precipitation for May during the last fifteen years, 6.25, occurred in 1880; the least, 1.14, in 1877. The total precipitation for the spring of 1887, 6.51, is 3.17 less than the average, and is the smallest precipitation since 1872, which had a total of 6.00 inches.

Pennsylvania.—Dyberry, Wayne Co.: during the last seventeen years the largest precipitation for May, 5.19, occurred in 1882; the least, 0.36, in 1875.

South Carolina.—Spartanburg, Sumter Co.: the greatest precipitation for May during the last seven years, 4.24, occurred in 1885; the least, 1.24, in 1882.

Texas.—New Ulm, Austin Co.: during the last fifteen years the greatest precipitation for May, 15.25, occurred in 1884; the least, 0.05, in 1886. The total precipitation for the spring of 1887 (March, April, and May), 5.00, is 9.61 less than the average for the same period.

Vermont.—Strafford, Orange Co.: the greatest precipitation for May during the last thirteen years, 4.55, occurred in 1884; the least, 0.40, in 1877.

Virginia.—Wytheville, Wythe Co.: the total precipitation of the first five months of 1887, 16.24, is 1.58 less than the average for the same months during a period of twenty-four years.

Dale Enterprise, Rockingham Co.: during the last seven years the greatest precipitation for May, 12.66, occurred in 1886; the least, 1.74, in 1881.

Variety Mills, Nelson Co.: the greatest precipitation for May, during the last eight years, 8.22, occurred in 1886; the least, 1.70, in 1883.

SNOW.

The dates on which snow fell in the various states and territories are as follows:

***California.*—Fort Bidwell *a*, 6th; *a*, *b*, 10th; *b*, 11th.**

***Colorado.*—Denver and Montrose, 1st, 2d; Pike's Peak, 1st, 2d, 7th, 13th, 15th to 19th, 21st to 24th, 26th to 29th, 31st.**

***Dakota.*—Fort Meade and Deadwood, 1st; Fort Yates and Bismarck, 1st, 2d; Richardton, 1st, 16th; Fort Sisseton, 2d; Fort Pembina, 16th, 17th.**

***Idaho.*—Fort Sherman, 10th.**

***Minnesota.*—Moorhead, 2d.**

***Montana.*—Helena, 1st, 11th to 13th, 20th; Fort Assinaboine, 12th.**

***Nebraska.*—Fort Sidney, 1st; Fort Robinson, 1st, 13th. At Hay Springs, snow fell on the 1st, 3d, and 14th; a rain storm began at 9 a. m. on the 1st, and at 10 a. m. the rain changed to snow, which continued until late at night; on the morning of the 2d the snow averaged eight inches on the level, and had drifted, in places, to a depth of six feet.**

***Nevada.*—Fort McDermit, 1st, 13th; Winnemucca, 10th.**

New Hampshire.—Mount Washington, 1st, 30th.

New Mexico.—Fort Union, 1st.

Oregon.—Fort Klamath, Lakeview, and Linkville, 6th, 9th, 10th; Albany, 12th.

Utah.—Frisco and Salt Lake City, 1st. At the latter station the snow storm which began at 5.40 p. m., April 30th, continued during the night and until 2.35 p. m. on the 1st. Reports from neighboring towns state that trees of all kinds were injured by the snow collecting on them and breaking the branches.

Wyoming.—Cheyenne and Fort Laramie, 1st; Fort Bridger, 1st, 2d; Camp Sheridan, 2d, 7th, 11th to 15th.

Table of excessive and greatest monthly precipitation for May, 1887.

Station.	Specially heavy.		Largest monthly.	Station.	Specially heavy.		Largest monthly.
	Date.	Amt.	Amount.		Date.	Amt.	Amount.
Alabama.				*Nebraska.*			
Livingston	26	2.65	6.42	Lincoln	12, 13	2.68	
Marion	4	2.15	6.00	Tecumseh	12	3.00	
Valley Head	31	2.00		Brownville	12, 13	3.75	
Opelika	27	2.73		Fremont	13	2.00	
Arkansas.				Fort Robinson	2	2.30	
Lead Hill			8.57	Crete	12, 13	4.69	
Russellville	2 to 4	4.90	7.83	*New Hampshire.*			
Hot Springs	2 to 5	4.32	6.65	Woodstock	25	3.85	6.30
Fort Smith	2 to 4	3.98	6.51	*North Carolina.*			
Little Rock	3, 4	2.68	6.08	Weldon *a*	10	6.03	8.07
Monticello	29	2.10		Goldsborough	8 to 10	4.03	7.83
Devalle Bluff	3, 4	2.07		Weldon *b*	10, 11	6.78	7.57
Texarkana	3, 4	2.89		Salisbury			7.21
Do	11	2.13		Chapel Hill	9, 10	2.19	6.59
Dakota.				Do	31	2.14	
Deadwood	1	2.04		Marion			6.17
Florida.				*Ohio.*			
Manatee	24	2.55	9.69	College Hill	12, 13	2.75	6.25
Do	30, 31	2.40		Wooster	31	2.01	
Alva	10	3.25	8.55	*Oregon.*			
Do	30, 31	3.00		Astoria			7.33
Jacksonville	21, 22	2.75	7.15	*Pennsylvania.*			
Live Oak	10, 11	2.02	7.13	Pittsburg	7, 8	2.24	
Cedar Keys	23	3.04		*South Carolina.*			
Georgia.				Yemassee	13, 14	2.19	
Macon	19	2.95		Branchville	13, 14	2.40	
Waynesborough	11, 12	3.89		Greenville	31	2.00	
Indiana.				Charleston	22, 23	2.33	
Princeton			6.10	*Tennessee.*			
Marengo	23	2.00	6.03	Chattanooga			6.57
Kansas.				Rogersville	5, 6	2.15	
Belleville	23, 13	5.55	6.42	Andersonville	30, 31	2.00	
Concordia	12	2.88	6.08	Careyville	31	2.03	
Wakefield	21, 22	3.05		Grief	31	2.50	
Louisiana.				Fosteria	23	2.00	
Grand Coteau	3	2.19	6.50	Hurricane Switch	25, 26	3.36	
Lafayette	4	2.23	6.01	*Texas.*			
Do	19	2.21		Tyler	3, 4	7.70	10.29
Coushatta	3	2.69		Paris	1, 2	4.80	8.76
Natchitoches	3, 4	2.35		Do	27	2.05	
Minden	3, 4	2.57		Fort Elliott	27, 28	3.18	7.01
Alexandria	28, 29	2.10		Palestine	2 to 4	3.84	6.76
Monroe	4	2.08		Dallas	2, 3	3.41	6.52
Liberty Hill	2, 3	3.87		Belton	2, 3	2.63	6.47
Shreveport	3, 4	2.45		Austin	9	2.17	6.12
Maryland.				Longview	3	4.00	6.02
New Midway			6.12	Fort Ringgold	14, 15	3.05	
Cumberland	7, 8	3.79		Corsicana	3	2.20	
Michigan.				Houston	18, 19	2.14	
Thornville	23	2.17		Huntsville	3	2.00	
East Saginaw	30	2.00		Hearne	3	2.97	
Chelsea	23	2.87		Luling	3	3.00	
Minnesota.				Waco	17	2.30	
Duluth	1, 2, 3	3.30		Rio Grande City	15	2.48	
Mississippi.				*Virginia.*			
Okolona	4	7.50	8.75	Rappahannock	24	2.03	8.51
Natchez	3	2.45	6.16	Do	30	2.66	
				Dale Enterprise			6.54
				University of Va			6.03
				Washington Ter.			
				Tatoosh Island			8.25

MONTHLY SNOWFALLS.

[*Expressed in inches and tenths.*]

The following stations report a monthly snowfall of one inch or more:

California.—Boca, 18; Summit, 5; Cisco, 4; Emigrant Gap, 3; Fort Bidwell, 2.5.

Colorado.—Pike's Peak, 23.7.

Dakota.—Deadwood, 18; Bismarck, 3.

Montana.—Fort Assinaboine, 4.

Nebraska.—Hay Springs, 8.

Nevada.—Toano, 1.5.

New Hampshire.—Mount Washington, 1.

Oregon—Lakeview, 1.5.

Utah.—Salt Lake City, 3.5.

Wyoming.—Camp Sheridan, 2.5.

SNOW ON GROUND AT END OF MONTH.

The only station reporting snow on the ground at the end of month was Pike's Peak, Colo., where snow remained to a depth of 18 inches.

HAIL.

Saint Paul, Minn.: on the afternoon of the 1st a thunder-storm, with high winds, heavy rain, and hail, occurred. The hail fell from 7.18 to 7.25 p. m.; the stones varied in size from a pea to a walnut, and a few measured eleven inches in circumference. The wind attained its greatest force during the hail storm, and twenty-five small frame houses were damaged or entirely demolished. Window-glass in nearly every high building in the city was broken; the loss being estimated at $10,000. The storm was quite severe in Minneapolis, where a large amount of window-glass was broken by the hail.

Duluth, Minn.: on the 1st, during a thunder-storm and heavy rain, hail fell rapidly, and in large quantities, some stones being one and a half inches in diameter. Many windows were broken and other property damaged; 3.15 inches of rain fell.

Pittsburg, Pa.: a thunder-storm, with heavy rain, prevailed from 8 to 11.35 p. m. of the 6th; from 8.05 to 8.20 p. m. the storm was accompanied by hail, which fell in sufficient quantity to cover the ground. The stones were about half an inch in diameter, but did little damage. During a thunder-storm on the afternoon of the 7th hail fell heavily for five minutes.

Belleville, Republic Co., Kans.: during the forenoon of the 12th a heavy rain passed from east to west; in the afternoon the heaviest rainfall that has ever been recorded here occurred. The storm was accompanied by hail which did but little damage at this place. On the 13th a rain storm was accompanied by hail of peculiar shape, the stones being round, flat, and oval, with projecting knobs; some of the larger stones measured five inches in circumference. A large part of the fruit crop was destroyed, and much damage done to grain.

New Orleans, La.: during a thunder-storm on the afternoon of the 18th heavy hail fell in the western part of the city and over the suburbs, doing considerable damage to gardens and buildings.

Concord, Cabarrus Co., N. C.: on the afternoon of the 19th a very destructive hail storm passed over the northern part of Cabarrus and southern part of Rowan counties. The hail fell, for forty-five minutes, over an area five miles wide and nine miles long and in some places to a depth, as reported by several persons, of eight inches, completely destroying the wheat, oat, and cotton crops, and stripping trees of leaves.

Valentine, Nebr.: on the afternoon of the 20th a thunder-storm, with hail, passed over the station from west to east. Hail fell from 6.40 to 6.50 p. m.; the stones were very large; a few were found to measure eight inches in circumference and weigh six ounces. They were formed of a nucleus of ice, surrounded by several alternate layers of snow and ice, and the whole having a thick covering of snow. Hail fell again from 7.25 to 7.40 p. m., but the stones were small.

Spartanburg, Spartanburg Co., S. C.: a thunder and hail storm occurred at this place on the afternoon of the 21st. At Glendale, in this county, much damage was done to the corn and cotton crops.

Franklin, Franklin Co., Nebr.: on the 22d, during a heavy thunder-storm, hail fell to a depth of two inches, stripping trees and shrubbery of leaves, beating crops to the ground, and injuring horses and cattle. Some of the stones were over an inch in diameter.

University of Virginia, Albemarle Co., Va.: a hail storm occurred in this vicinity on the 25th which caused considerable damage to vineyards, etc.

Fort Thomas, Ariz.: a violent thunder-storm set in at 1.34 p. m. of the 25th, at the same time the wind blew with gale force, and heavy hail fell, the stones varying from one-fourth to one and one-fourth inches in diameter. All windows facing

south and southwest were broken. The hail fell until 3.05 p. m., when 2.25 inches of rain and melted hail had fallen.

Sioux City, Woodbury Co., Iowa: on the afternoon of the 26th a heavy rain was followed by one of the most severe hail storms of many years, which did great damage to windows and growing crops.

Erie, Pa.: on the 30th a thunder-storm, moving from south to north, prevailed from 5.30 to 6.42 p. m. Temperature before the storm, 82°.7; wind, south; after the storm, temperature, 62°.0; wind, southwest. A severe hail storm passed over a section of country near here, doing considerable damage to vegetation of all kinds. At Edinborough, twenty miles south, all windows in the south side of the buildings were broken by hail, and trees blown down by the wind.

Atlanta, Ga.: a heavy thunder-storm, with hail, approached from the northwest on the afternoon of the 31st. The hail fell for three minutes only, but in sufficient quantity to do considerable damage to growing crops.

Hail is also reported to have occurred as follows:

Alabama.—Mobile, 23d; Montgomery, 24th.

Arizona.—Fort Bowie, 25th, 30th; Fort Grant, 25th; Whipple Barracks, 26th; Fort Apache, 27th.

Arkansas.—Lead Hill, 4th, 10th, 31st.

California.—Nicolaus, Fort Bidwell, and Red Bluff, 6th.

Colorado.—Pike's Peak, 22d, 23d; Colorado Springs, 22d, 26th.

Dakota.—Fort Totten *a*, 1st; Fort Totten *b*, 7th; Parkston, 12th, 21st; Huron, 13th; Fort Sully, 14th, 26th; Webster, 23d; Bismarck, 25th; Fort Pembina, 20th.

Florida.—Jacksonville, 10th.

Georgia.—Forsyth, 11th; Atlanta, 31st.

Idaho.—Fort Sherman, 5th, 7th, 10th, 11th.

Illinois.—Cairo, 31st.

Indiana.—Butlerville, 1st; Mauzy, 2d, 21st; Vevay, 11th; Logansport, 21st, 22d, 24th; Indianapolis, 21st.

Indian Territory.—Fort Supply, 14th, 26th; Fort Reno, 23d.

Iowa.—Independence, Cresco, Fort Madison, and Oskaloosa *a*, 1st; Davenport, 1st, 29th; Muscatine, 14th; Clinton and Des Moines, 21st; Keokuk, 22d; Oskaloosa *b*, 29th.

Kansas.—Belleville, 12th, 13th, 21st; Wakefield, 12th, 13th, 22d; Salina, 12th, 13th, 20th, 26th; Concordia, 12th, 22d; Allison, 13th; Ninnescah, 13th, 15th, 16th, 21st; Wilson, 13th, 15th, 22d; Dodge City, 23d, 24th; Independence, 24th.

Kentucky.—Harper's Ferry, 11th, 24th.

Louisiana.—Liberty Hill, 29th.

Maryland.—New Midway, 6th; Cumberland, 7th, 8th; Woodstock, 26th.

Michigan.—Traverse City, 2d; Marquette, 22d; Thornville, 23d, 30th; East Saginaw and Escanaba, 24th.

Minnesota.—Fort Snelling and Moorhead, 1st; Minneapolis, 1st, 21st; Duluth and Saint Paul, 1st, 29th; Saint Vincent, 19th, 28th.

Missouri.—Fayette, 1st, 22d.

Nebraska.—Niobrara, 13th, 20th; Fort Robinson and Genoa, 16th; Hay Springs, 20th; Brownville, 26th.

Nevada.—Fort McDermit and Carson City, 19th.

New Jersey.—Readington, 27th; South Orange, 28th.

New Mexico.—Fort Union, 15th; Gallinas Spring, 17th, 27th; Fort Seldon, 25th; Santa Fé, 26th.

New York.—Albany 2d, 5th; Humphrey, 6th, 26th; New York City, 26th.

North Carolina.—Flat Rock, 16th; Lenoir, 30th.

Ohio.—Cleveland *a*, 1st, 2d; Wauseon, 1st, 2d, 31st; Cleveland *b*, 2d; Lordstown, 7th; College Hill, 11th, 12th; Columbus, 22d; Ruggles, 23d; Westerville, 24th; Tiffin, 30th.

Oregon.—Bandon, 2d, 10th; Albany, 6th, 10th; East Portland, 7th, 8th; Mount Angel, Ashland, Astoria, and Roseburg, 10th.

Pennsylvania.—Pittsburg, 26th; Blooming Grove, 27th; Erie, 30th.

South Carolina.—Spartanburg, 9th, 21st.

Tennessee.—Milan, 7th, 26th; Knoxville, 9th, 25th; Ashwood, 10th, 25th, 27th; Chattanooga, 10th, 30th; Nashville, 13th, 25th; Austin, 25th.

Texas.—Palestine, 2d, 10th; Abilene, 8th, 9th; Fort Concho, 24th; Silver Falls, 26th.

Vermont.—Lunenburg, 26th.

Virginia.—Dale Enterprise, 6th, 25th, 26th.

Washington Territory.—Port Angeles, 5th; Spokane Falls, 10th.

West Virginia.—Clarksburg and Middlebrook, 26th.

Wisconsin.—Embarras, Madison, and Manitowoc, 29th.

Wyoming.—Fort Laramie, 11th, 12th, 27th; Camp Sheridan, 31st.

SLEET.

Sleet fell at the various places during the month, as follows: Cheyenne, Wyo., 1st; Moorhead, Minn., 2d; Tatoosh Island, Wash., 5th, 7th; Roseburg, Oregon, 6th; Pike's Peak, Colo., 13th; Alma, Colo., 15th.

DROUGHT.

Drought has prevailed over a large part of the country during the month, as a result of the small rainfall of April and May; it has been most severe in portions of New England and in the northwestern and western sections of the country. The rains of the latter part of May, in some instances, terminated droughts which were reported to have been the most severe experienced in years.

Concerning the drought of May, the following notes are given:

California.—San Diego, 16th: the weather is very dry in this part of the state; the pastures are drying up.

San Francisco, 28th: reports from the northern and central portions of California show that the hot winds of the past two days caused serious injury to the wheat crop, and also to strawberries and other fruits.

Dakota.—Parkston, Hutchinson Co., 31st: the month has been hot and dry, and the grain crop has been seriously injured in consequence.

Georgia.—Atlanta, 21st: the prolonged drought in this vicinity was broken by the rains of the 19th and 20th; prior to these rains vegetation was suffering seriously.

Illinois.—Elgin, Kane Co., 21st: farmers from the surrounding country report that, owing to drought, the pastures have become exhausted, and the crops are much injured. Some of the rye fields have been ploughed over and planted with corn.

Chicago, 21st: a dispatch from Saint Paul, Minn., to "The Times" states that reports from various points in Minnesota and Dakota show that rain is greatly needed, especially in the Red River Valley, and that the grain crops have suffered seriously.

Indian Territory.—Fort Reno: previous to the 10th the weather was very dry and it was feared that crops would be a failure; they were greatly benefited, however, by rains of the 10th and 11th, on which dates the rainfall amounted to about one and one-half inches.

Iowa.—Dubuque, 25th: the ground is very dry in this section of the state, and farmers report that crops, especially hay, are being injured by drought.

Des Moines, 31st: reports from the central and western portions of the state say that rain is much needed.

Oskaloosa, Mahaska Co., 31st: May has been a very dry month; the pastures are much injured; corn is doing well.

Cresco, Howard Co., 31st: the drought which has prevailed since May 1st has not been exceeded in severity for thirty years; some barley fields have been ploughed up; the hay crop will be short. The total rainfall for the month was but eight-tenths of an inch.

Cedar Rapids, Linn Co., 31st: the month just closed, in this section has been one of the driest for years. The growing crops are not yet suffering seriously, but the pastures are nearly bare, and in some sections of the state it is reported that the hay crop will be very short. The monthly rainfall at Oskaloosa amounted to but little more than one inch.

Maryland.—Fallston, Harford Co., 31st: the warm, dry weather from the 10th to 24th had an injurious effect; small garden seeds near the surface did not germinate until the occurrence of the rains at the close of the month.

Michigan.—Muskegon, Muskegon Co., 13th: this region is suffering from a severe drought; but little rain has fallen since the winter snowfall melted; all crops are suffering.

Thornville, Lapeer Co.: up to the 23d the month was hot and dry, but on that date there was a heavy rain. The drought caused much injury to the clover crop.

Birmingham, Oakland Co., 31st: drought prevailed during the greater part of this month and caused much damage to the growing crops.

Minnesota.—Saint Paul, 27th: the drought in central Wisconsin continues unbroken. Rain is also needed in northern Iowa, although no damage to crops is yet reported.

Rochester, Olmsted Co.: nearly an inch of rain fell at this place on the 30th, ending the long-continued drought which prevailed in this section.

Lanesborough, Fillmore Co., 30th: the protracted drought in this section

was broken by the copious rains at the close of the month. The drought has been of unusual severity and has caused much injury to crops, but wheat, oats, and corn were greatly revived by the rains.

Mississippi.—Vicksburg: a heavy rain began in the early morning and ended at 8.25 a. m. on the 4th. Reports from the surrounding country show that this rain was general, breaking the long-continued drought. Crops were in such condition that had the drought continued for another week the result would have been disastrous.

Nebraska.—Brownville, Nemaha Co.: the drought in this section was broken by the rain of the 10th.

Omaha: the rainfall throughout Nebraska during the night of the 12–13th was of great benefit to the crops which, at that time, were beginning to suffer from drought.

New Jersey.—The "New York Sun" of May 21st contained the following: "The drought is getting to be serious in New Jersey. Small seeds do not germinate, and kitchen gardens are being replanted, and in some cases planted for the third time. Extensive raisers of garden truck place hay about their plants to retain what moisture is collected at night. Grain is rushing into head before its time. It will not fill, and the straw will be short. It is feared that early small fruits will be almost a failure. Wells are dry, and springs that were never known to fail before are without a pint of water. The hauling and peddling of water in barrels is already a part of the season's work."

New York.—Humphrey, Cattaraugus Co., 22d: the crops are suffering for want of rain; the streams are very low.

New York City, 25th: the surrounding country is suffering from severe drought; on the 26th 0.35 inch of rain fell, which was much needed in this section.

Factoryville, Tioga Co.: from the 1st to the 24th no appreciable amount of rain fell, and the roads were very dry and dusty; from the 24th to the 31st the rainfall amounted to 1.32 inches.

North Carolina.—Reidsville, Rockingham Co., 31st: previous to the 6th wheat, oats, and corn suffered from drought, but were greatly improved by subsequent rains.

Ohio.—Wauseon, Fulton Co.: the drought was broken by the rain of the 23d and 24th. The spring season in this vicinity has been the driest for the last fifteen years.

Tiffin, Seneca Co.: a much needed rain fell in this vicinity on the 30th.

Pennsylvania.—Quakertown, Bucks Co., 26th: the drought up to this date has not injured vegetation in this locality, but the streams and wells are low, and cisterns are dry; some people are hauling water for domestic use, etc.

South Carolina.—Kirkwood, Kershaw Co., 31st: in this immediate neighborhood the rainfall has been insufficient for the crops, but in this county, generally, the crops are very promising.

Texas.—A special dispatch from Laredo, Tex., to the "Saint Louis Globe-Democrat" on the 13th stated that the rain of that date was the first of any consequence that had fallen at Laredo in eight months.

Wisconsin.—La Crosse, 31st: the month was characterized by the drought which prevailed from April 23d, and which was only broken by light rains on the last few days of the month. The total precipitation for the month was 0.50 inch, the least that has been recorded for this month since the establishment of the signal station here.

Delavan, Walworth Co., 31st: the protracted drought was broken on the 22d by a heavy rainfall.

WINDS.

The most frequent directions of the wind during May, 1887, are shown on chart II by arrows flying with the wind; in the lower lake region and Ohio Valley they were from the northeast; in the Gulf States, and along the Atlantic coast, from southeast to southwest; in the upper Mississippi valley, upper lake region, north Pacific coast, and Rocky Mountain regions, variable; in California, from the west or southwest.

HIGH WINDS (in miles per hour).

Wind-velocities of fifty or more miles per hour, (on mountain stations at or exceeding 70 miles) other than the maximum velocities for the month, which are given in the table of miscellaneous data:

Fort Totten, Dak., 51, n., 29th.

Valentine, Nebr., 50, nw., 1st.

Mount Washington, N. H., 78, nw., 1st; 77, nw., 4th; 86, nw., 12th.

Pike's Peak, Colo., 70, sw., 1st.

LOCAL STORMS.

Pittsburg, Penn.: a violent wind and rain storm occurred during the afternoon of the 5th along the Pennsylvania Railroad, about forty-five miles east of Pittsburg. Considerable damage was done to the bed of the Ligonia Valley Railroad; trains were delayed for several hours.

Columbus, Ohio: a thunder-storm, with heavy rain and high wind, set in about 6 p. m. of the 5th; maximum velocity of the wind thirty-two miles per hour, from the south. The storm did considerable damage in different parts of the city. A church steeple, and numbers of trees, sheds, and fences were blown down. Severe thunder-storms occurred also on the afternoon of the 22d and 23d; the storm of the 22d was accompanied by hail, which did some damage to vegetation. On the 23d the electrical part of the storm was intense, the lightning being vivid and incessant.

Buffalo, N. Y.: on the night of the 5–6th a severe thunder-storm prevailed from 10 p. m. until 3 a. m. and did considerable damage in this city and vicinity. The lightning was vivid and almost continuous; several buildings were struck of which three were burned, and the remainder slightly injured. A destructive thunder-storm, accompanied by heavy rain, occurred also on the 7th.

New York City, 6th: much damage was done by lightning in the northern and western portions of New York on this date. Reports from Binghamton, Broome Co., Livonia, Livingston, Co., and Canajoharie, Montgomery Co., give accounts of damage done at those places. At Canajoharie buildings valued at $12,000 were destroyed.

Abilene, Tex.: on the night of the 8–9th a thunder-storm, with hail and high wind, occurred; from 1.30 to 1.45 a. m. the wind blew at the rate of fifty-two miles per hour, but did very little damage; this is the highest velocity the wind has reached since this station was established in 1885. A thunder-storm, with hail, prevailed from 6.45 to 8.50 p. m. of the 9th.

Weldon, Halifax Co., N. C., 10th: light rain fell from 10 a. m. to 12.30 p. m., when it increased to a heavy rain, which from 1 to 4 p. m. fell in torrents; after 4 p. m. light rain continued until about midnight. During this time more than six inches of rain fell. The meteorological record at this place extends back fifteen years and this is the heaviest rainfall for that period.

Washington, Wilkes Co., Ga.: about 5 p. m. of the 11th a violent wind, rain, and hail storm occurred in this vicinity. A number of buildings were either blown down or unroofed, and many trees prostrated. The hail caused much damage to crops.

Omaha, Nebr.: during the evening of the 13th a severe wind and rain storm prevailed in eastern Nebraska. In this city several small houses were wrecked and lumber piles scattered.

Frederick, Brown Co., Dak.: A severe southwesterly gale began at this place at about 6 p. m. of the 14th; considerable damage was done to lightly constructed buildings.

Petoskey, Emmet Co., Mich.: during a severe wind-squall at 11.30 a. m. of the 22d, a yacht was capsized on Little Traverse Bay, and six persons were drowned.

Delevan, Walworth Co., Wis.: a heavy rain storm occurred on the 22d; the rain fell in torrents and was accompanied by very high winds which did damage to fences and shade trees.

Wakefield, Clay Co., Kans.: during the thunder-storm of the 22d small out-buildings and fences were prostrated, and one house unroofed.

Clay Centre, Kans.: at Idana, eight miles west of this place, a severe wind storm prevailed at about 6.30 p. m. on the 23d. A number of dwellings and a school-house were blown down, and several railway cars were blown from the tracks.

Montgomery, Ala.: a destructive thunder-storm passed over this city between 2.47 and 3.40 p. m. of the 24th. Rain fell from 3.08 to 4.04 p. m. At 3.10 p. m. the wind suddenly increased from a velocity of ten miles per hour to gale force, blowing for a short time at the rate of forty-seven miles per

hour, accompanied by hail and heavy rain. The wind damaged fences and roofs to the extent of $3,000.

Wetumpka, Elmore Co., Ala.: a severe wind and rain storm occurred here on the 24th, causing much damage to buildings, fences, and trees. This storm was also severe in Lee and Dallas counties.

Rio Grande City, Tex., 29th: the heavy rain accompanying the thunder-storm of this date caused the river to rise suddenly; considerable damage was done to crops, and many domestic animals were drowned. The wind during the storm was very heavy, blowing down frail buildings and fences.

Chattanooga, Tenn.: shortly after 4 p. m. of the 30th a thunder-storm, moving from south to north, set in and continued with great violence until after midnight. From 5 to 8 p. m. the storm gradually changed its direction of progress, and at the latter hour was moving from the east, accompanied by heavy rain, violent gusts of wind, vivid lightning, and for eight minutes by hail. The wind, together with the rain, hail, and lightning, injured telephone, electric light, and fire-alarm wires, and blew down a number of trees, signs, etc.; highest velocity of the wind, thirty miles per hour, at about 8 p. m. During the evening the barometer rose rapidly, a rise of .14 inch occurring between 7.55 and 8.10 p. m. A severe thunder-storm, with hail, occurred on the afternoon of the 10th, during which a building was struck by lightning and one person injured. On the afternoon of the 22d the lightning was unusually vivid and the rainfall heavy; several buildings were struck and one person killed by lightning.

Report of tornadoes for the month of May, 1887, by Lieut. John P. Finley, Signal Corps, U. S. Army, Assistant.

Place.	Date.	Time.	Direction.	Form of cloud.	Number of persons killed.	Number of persons wounded.	Width of path in feet.	Number and kind of animals killed.	Number and kind of buildings destroyed.	Total valuation of property destroyed.	Authority.
Fergus Falls, Minn	1	4.30 p m	e.		None	None			Several barns		Saint Paul "Pioneer Press."
Neillsville, Wis. *a*	1	9 p.m	ne.		None	None					I. T. Carr, Neillsville, Wis.
Johnstown, Dak	1				None	None			Trees prostrated and crops damaged.		I. N. Johnson, Johnstown, Dak.
Rollag, Minn. *b*	1		se.	Funnel	None	None					W. Middagh, Rollag, Minn.
Milltown, Wis	1	6 p. m	ne.		None				A large number of houses and barns destroyed; trees and fences prostrated.		F. H. Rasmussen, El Salem, Wis.
Saint Paul, Minn. *c*	1	6 p. m	ne.						Telephone and telegraph wires prostrated, several houses unroofed, and trees broken.	$15,000	Saint Paul "Pioneer Press."
Wauseon, Ohio *s*	2	12.35 p. m.	n. 20° e.	Funnel	1	7	40		School-house destroyed, buildings unroofed, fences prostrated.	1,500	Thos. Mikesell, Wauseon, Ohio.
Vanlue, Ohio	2	3.30 p. m	ne.		None	None	2,640 to 3,960		Fences and out-buildings blown down.		W. Alspach, Vanlue, Ohio.
Personville, Tex. *d*	2	4 p. m	ne.						Fences and trees prostrated.		J. F. Boyd, Personville, Tex.
Somerset county, Pa. *e*	3	Evening	easterly		None	None			Very destructive		W. M. Hill, Baird, O. M. Irvine, Duncansville, R. C. Hefley, Berlin, Pa.
Bedford county, Pa. *e*	3	Evening	e.		None	None			Crops, trees, and out-buildings damaged.		
Blair county, Pa. *e*	3	Evening	ene.								
Somerset county, Pa. *f*	4	Evening	ne.		None	None	1,320	None	Very destructive		S. A. Hamilton, Roaring Spring, G. Hoover, Hooversville, G. W. Gump, Napier, Pa.
Bedford county, Pa. *f*	4	6 p. m	ne.		None	None	1,320		Large trees twisted off and crops destroyed.		
Blair county, Pa. *f*	4	6 p. m	ne.		None	None		None	Very destructive		
Big Lick, N. C. *g*	6	3.30 p. m	ne.		None	None		Several	Much damage to buildings, stock, crops, &c.		David Burris, Big Lick, N. C.
Eden Centre, N. Y. *h*	7	1.30 p. m	ne.		None	None	Narrow				W. P. Hunt, Eden Centre, N. Y.
Johnson county, Ark	10	4.30 p. m	ne.	Funnel	None	None	Narrow		Great damage to crops		G. Bradley, Ozone, Ark.
Belle Place, La. *i*	10	Evening	ne.	Funnel	None	None					Rev. C. M. Widman, S. J., Grand Coteau, La.
Gilmore, Nebr. *j*	13	5.25 p. m	ne.	Funnel			Narrow		Considerable damage to property.		S. B. Knapp, Gilmore, R. L. Carpenter, Papillon, Nebr.
Blue Springs, Nebr. *k*	13	4.30 p. m	ne.	Funnel	1	1	200		Totally destroyed school-house, and badly damaged 2 stores, 2 churches, and several dwellings and out-buildings.		J. Guittard, Barneston, W. J. Dunnick, Lanham, D. Patterson, Wymore, Nebr.
Kansas City, Mo. *l*	13	10.30 p. m.	e.	Funnel	None	None					A. Schmitt, Le Roy, Kans.
Near Colony, Kans. *m*	16	2 a. m	ne.	Funnel	None	None	Narrow	17 cattle			E. Blair, Cadmus, Dr. G. W. Haines, La Harpe, Kans.
Sun Dance, Wyo	20		ne.	Funnel			1,320		Trees prostrated		G. A. Teel, Sun Dance, Wyo.
Idana, Kans. *n*	22	6.45 p. m	ne.	Funnel	None	None			Destroyed school-house.		C. N. Smith, Idana, I. D. Graham, Manhattan, Kans.
Lisbon, Dak. *o*	23	11.30 a. m.	se.	Funnel	None		10,560				B. B. Breed, Lisbon, Dak.
Altamahaw, N. C. *p*	25	3.30 p. m	ne.	Funnel	None	None	2,640		Orchards and crops damaged.		A. T. Smith, Altamahaw, N. C.
Hiattville, Kans. *q*	28	3 p. m	ne.	Funnel	None	None			No buildings in path		E. Blair, Cadmus, Kans.
Fredonia, N. Y	30	5 p. m			None	None	5,280		Great damage to crops by hail; fences and out-buildings blown down and trees broken off.		E. F. Southwick, Fredonia, N. Y.
Loganville, Ohio *r*	30	12.45 p. m.	ne.	Funnel	None	None			Trees, fences, roofs, and small buildings.		Lewis Huddle, Logan, Ohio.

a Heavy black cloud, accompanied by a terrific roar.
b Cloud did not seem to point to the earth, but rather lay on its side with the end of the funnel to the southeast.
c A large black cloud fringed with gray, ominous "shell caps."
d A dark, blue looking cloud with a white streak under it appeared in the west, moving rapidly.
e Cloud accompanied by a roaring noise.
f A dark bank of clouds with an opening in the centre, the edge of which hung down like the bottom of a ragged curtain, moving rapidly, with a terrific roar.
g Cloud very dark and thick, with white racks like smoke over the cloud.
h Cloud very low and moved at a rapid rate with a heavy roar.
i Large dark clouds were seen at a great height, when a column of spray gradually rose to an elevation that rendered it distinct to the whole country; it appeared like a great column of smoke, which soon connected with the clouds; the column broke twice, but each time reunited.
j A dark, funnel-shaped cloud, moving at a terrific pace.
k Two funnel-shaped clouds, very dark and dense.
l Dark and decidedly ominous looking funnel-shaped cloud, with a sort of eddying movement.
m The clouds had concentrated in a dense, dark mass, from which projected a long black arm, apparently but a few feet in diameter, swaying in graceful curves almost to the earth.
n Appeared like a great icicle pointed at the end and connected with a black cloud, having a diameter of several hundred hundred feet.
o Had the appearance of a water-spout and accompanied by a noise like the roaring of the ocean.
p A small, narrow cloud, apparently not over half a mile in width, almost square on either side, with a long tail of a whitish color tapering to a point, moving rapidly.
q A black, conical cloud which did not seem to reach the earth, but twisted off the tops of trees.
r A very heavy, angry looking, black cloud first appearing in southwest.
s A very black cloud, shaped like a balloon.

WATER-SPOUTS.

Mr. James Mainwaring, observer on the s. s. "Athos," Capt. Horatio Law, commanding, reports having observed several water-spouts off the east end of Jamaica, W. I., on May 18, 1887.

Capt. W. N. Aldrich, of the schooner "Comet," reports water-spouts as follows: May 18th, N. 22° 08′, W. 94° 40′, one small one; 28th, N. 25° 07′, W. 86° 05′, three within half an hour; 29th, N. 24° 15′, W. 85° 25′, two in northeast and one in southeast.

Captain Garvie, of the s. s. "Caledonia," reports having observed a large water-spout in N. 38° 30′, W. 17° 0′, on May 29th.

COTTON REGION REPORTS.

In the following table are given the means of the maximum and minimum temperatures, and the average rainfall for the cotton-belt districts during the month. For the purpose of comparison the means for the four preceding years are also given. The district of Wilmington, only, shows an excess of precipitation, 1.10 inches above the normal; all the other districts have deficiencies, ranging from 0.22 inch for the district of Mobile to 2.81 inches for the district of Memphis. The district of Wilmington shows the greatest average precipitation for the month, 4.81 inches, and the district of Memphis the least, 1.88 inches.

The means of the maximum and minimum temperatures are in all districts above the normal; the departures of the maximum temperature ranging from 2°.1 for the district of Savannah to 6°.4 for the district of Memphis, and the departures of the minimum temperature from 0°.4 for the district of Charleston to 5°.1 for the district of Little Rock. The district of Galveston shows the highest maximum temperature for the month, 101°.0, and the district of Vicksburg the lowest minimum temperature, 30°.0.

Temperature and rainfall data for the cotton districts, May.

Districts.	Rainfall.			Temperature.							
				Maximum.			Minimum.			Extremes for May, 1887.	
	Average for May of four preceding years.	Average for May, 1887.	Departures.	Mean for May of four preceding years.	Mean for May, 1887.	Departures.	Mean for May of four preceding years.	Mean for May, 1887.	Departures.	Max.	Min.
	Inch.	*Inch.*	*Inch.*	°	°	°	°	°	°	°	°
New Orleans...	5.46	4.13	— 1.33	83.7	88.3	+ 4.6	62.6	63.6	+ 1.0	100	44
Savannah	3.12	2.44	— 0.68	85.5	87.6	+ 2.1	62.0	63.3	+ 1.3	100	43
Charleston.....	3.46	3.55	— 0.91	83.3	86.3	+ 3.0	59.4	59.8	+ 0.4	94	44
Atlanta.....	3.02	2.65	— 0.37	80.8	85.2	+ 4.4	56.5	59.4	+ 3.2	98	44
Wilmington ...	3.71	4.81	+ 1.10	80.9	83.1	+ 2.2	56.1	60.0	+ 3.9	97	43
Memphis.....	4.69	1.88	— 2.81	79.3	85.7	+ 6.4	56.4	60.5	+ 4.1	97	40
Galveston	6.53	4.53	— 2.00	83.8	87.2	+ 3.4	62.1	63.5	+ 1.4	101	38
Vicksburg	5.79	3.95	— 1.84	82.0	87.4	+ 5.4	61.1	61.5	+ 0.4	99	30
Montgomery ..	3.23	2.88	— 0.35	83.5	86.8	+ 3.3	58.8	63.0	+ 4.2	97	46
Augusta	3.17	2.52	— 0.65	83.3	86.6	+ 3.3	58.8	59.9	+ 1.1	97	41
Little Rock.....	5.85	4.05	— 1.80	79.6	83.9	+ 4.3	55.3	60.4	+ 5.1	97	35
Mobile.....	3.96	3.74	— 0.22	82.5	87.8	+ 5.3	60.1	62.2	+ 2.1	98	43

INLAND NAVIGATION.

STATE OF WATER IN RIVERS AND HARBORS.

In the following table are shown the danger-points at the various river stations and the highest and lowest depths for May, 1887, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, May, 1887.

[*Expressed in feet and tenths.*]

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, La	29.9	21, 22, 23	16.7	2	2.7	14.0
Arkansas River:						
Fort Smith, Ark	22.0	7	9.0	15, 17	3.2	5.8
Little Rock, Ark	23.0	6	16.5	3	4.4	12.1
Missouri River:						
Omaha, Nebr.....	18.0	24	9.8	2 to 8	7.6	2.2
Leavenworth, Kans.....	20.0	25	12.3	8	9.0	3.3
Mississippi River:						
Saint Paul, Minn.....	14.5	1, 2	5.8	31	3.4	2.4
La Crosse, Wis	24.0	1	10.3	31	5.0	5.3
Dubuque, Iowa	16.0	1	13.7	31	5.8	7.9
Davenport, Iowa	15.0	1	11.1	31	4.3	6.8
Keokuk, Iowa.....	14.0	2, 3, 4	11.0	31	4.7	6.3
Saint Louis, Mo	30.0	7	18.4	26	14.6	3.8
Cairo, Ill	40.0	3	39.3	31	17.6	21.7
Memphis, Tenn.....	34.0	5	31.6	31	15.2	16.4
Vicksburg, Miss	41.0	14, 15	38.2	31	25.9	12.3
New Orleans, La	13.0	19	12.5	31	10.2	2.3
Ohio River:						
Pittsburg, Pa	22.0	1	10.7	23	2.2	8.5
Cincinnati, Ohio	50.0	2	35.0	31	9.8	25.2
Louisville, Ky.....	25.0	1, 2, 3	12.4	31	5.6	6.8
Cumberland River:						
Nashville, Tenn	40.0	3	20.3	30	3.9	16.4
Tennessee River:						
Chattanooga, Tenn.....	33.0	1	6.6	22, 23, 24	4.6	2.0
Monongahela River:						
Pittsburg, Pa	22.0	1	10.7	23	2.2	8.5
Savannah River:						
Augusta, Ga	32.0	13	8.8	24, 30, 31	6.0	2.8
Sacramento River:						
Sacramento, Cal	.....	1	20.5	16, 17, 18	18.0	2.5
Willamette River:						
Portland, Oregon.....	.....	31	21.2	1	10.5	10.7

Hudson River.—Albany, N. Y.: from the 17th of April until the 1st of the current month the river rose steadily, and at noon of the latter date was thirteen feet above low-water mark On the 2d, 3d, and 4th the water receded slowly, but rose slightly on the 5th.

Mississippi River.—Cairo, Ill.: the river at this point reached its highest stage, 39.3 feet above low water, on the 2d; from the 2d until the 18th it fell slowly to 25.0 feet; from the 18th to 21st it rose .4 foot; from the 21st to the end of the month it fell steadily, being on the 31st 17.6 feet above low-water mark.

Cumberland River.—Nashville, Tenn.: the river was at its greatest height on the 3d. After the 3d it fell steadily, and at the end of the month was only 3.9 feet above low-water mark.

Lake Superior.—Duluth, Minn.: the lake at this port was filled with broken ice until the 9th, when it moved out before a northwesterly wind. Navigation opened on the 6th; on this date the propeller "Spokane" arrived from Buffalo, N. Y., and the "Jas. Fisk, jr." departed.

Marquette, Mich.: on the 1st the broken ice in the harbor was driven out by a strong southwest wind. On the 2d several vessels left for ports on the lower lakes.

Fort Totten, Dak., 7th: the navigation on Devil's Lake opened to-day. The steamer "Minnie H.," Capt. E. E. Herrman, made the first trip of the season.

Fort Smith, Ark., 31st: the river has remained higher this month than it has been since January. Copious rains fell both at this point and above here on the river.

FLOODS.

Augusta, Me.: at the beginning of the month the rivers in Maine, swollen by the heavy rains of the last two days of April and the consequent melting of the large amount of snow in the forests, were unusually high. On the 1st the Kennebec and its branches were at flood height; in the vicinity of Augusta the river was about twelve feet above its average height, and flowing swiftly. All cellars and basements in the lower part of the city were flooded. In the surrounding country great damage was done; many bridges were carried away, roads

destroyed, and travel rendered difficult. Reports from Waterville, Gardiner, Fairfield, and other places on the Kennebec, state that the river was higher on the 1st and 2d than it has been since 1869. The Maine Central Railroad was covered with water at several places. At Somerset Mills a raft of logs worth $20,000 was broken up and carried to the sea.

Bangor, Me.: on the 29th and 30th of April, and during the first sixteen days of the current month, the water in the Penobscot River and its tributaries was, owing to heavy rains and melting snow in the forests and mountains, at a higher stage than it has been for many years, entailing severe losses on lumbermen, saw-mill owners, and farmers along their banks. At Ellsworth several booms and wing-dams were broken, and large numbers of logs floated out to sea. At Sangerville, Hartford, Linn, and other towns on the river, great damage was done to the manufacturing interests, several woolen and cotton mills being flooded, undermined, or otherwise injured, causing a suspension of operations and large losses. On the 13th the river was reported to have been still at an unusual height, and over its banks from Pamedecook Lake to the sea. The railroad from Bangor to Saint John, New Brunswick, and the country through which it passes, was badly washed, and traffic between Bangor and Vanceborough was suspended from the 1st to 12th. Reports from Danforth, Washington Co., on the 6th stated that the water at that place had reached a height eighteen inches higher than any previous record.

Pittsburg, Pa.: on the afternoon of the 7th a heavy thunderstorm, with rain and hail, passed over this station. Several buildings were struck by lightning and slightly damaged. Along Paint Creek, in Cambria county, a very heavy fall of rain occurred, causing the creek to rise suddenly and overflow the Somerset and Cambria Railroad, and damaging much property in the village of Johnstown. Many thousands of logs and numerous bridges were carried away. At Hooversville more than twenty bridges were washed from their foundations, and the cellars of nearly all dwellings flooded. At Morrillville, Minersville, Cambria City, and Coopersdale many persons were temporarily rendered homeless. It is estimated that the flood ruined property to the extent of $150,000.

Lynchburg, Va.: heavy rain fell from 8 p. m. of the 9th until the early morning of the 10th; at 9.10 a. m. it again began falling heavily and continued until 9.25 p. m. The storm did no damage in this vicinity, but along the valley of the Sandy River several mills, dams, and bridges were carried away.

Petersburg, Va.: on the 11th and 12th very heavy rain fell in the eastern part of the state and streams in the lower counties, along the coast, were higher than they had been for years. The abutments of an iron bridge which spans Fountain Creek, on the Petersburg and Weldon Railroad, were washed away and the bridge was carried down the stream. A number of mills and small bridges in several southeastern counties were damaged, as well as many acres of peanut and corn.

Laredo, Tex.: the heavy rains which fell throughout the Rio Grande Valley during the night of the 14–15th caused the Rio Grande River to rise rapidly; from midnight to noon the river rose eight feet. On the 15th the custom-house at Laredo was washed away, and one of the largest ferry boats on the river was sunk.

Gorham, Coos Co., N. H.: on the 14th the Androscoggin River between this place and Umbagog Lake was higher than it has been for several years, the flood having been caused by the melting of the winter snowfall in the lake region. A portion of the streets in Gorham was covered with water to a depth of three feet. No serious damage was reported.

Las Animas, Colo.: although but little rain accompanied the thunder-storms of the 26th, 27th, and 28th in this immediate vicinity, in the surrounding country very heavy rain fell and caused streams to rise rapidly. Washouts occurred on the Atchison, Topeka, and Santa Fé Railroad, both east and west of this place.

HIGH TIDE.

Cedar Keys, Fla., 26th.

ATMOSPHERIC ELECTRICITY.

AURORAS.

During the month no unusual auroral displays occurred; those observed during the nights of the 23–24th to 25–26th, the most extensive seen, were reported from New England westward to Montana and as far south as New Jersey, but cloudiness in the Lake region obscured the displays in that district. These auroras were not of unusual brilliancy and no appreciable influence upon telegraph lines has been reported. From the reports received it appears that the displays were most brilliant in Minnesota and Dakota. At Moorhead, Minn., the aurora appeared in the form of a double arch, with streamers moving from east to west, and similar reports are received from other stations in the extreme northwest.

Auroras were reported during the month as follows:

2d.—Pekin, Ill.; Nashau, N. H.; Boston, Mass.; Fort Maginnis, Mont.

3d.—Bismarck and Fort Totten, Dak.

4th.—Poplar River, Mont.

11th.—Pekin, Ill.; Orono, Me.

12th.—Morganfield, Ky.; Orono and Eastport, Me.; Mount Washington, N. H.; Northfield, Vt.; Saint Vincent, Minn.

13th.—Eastport, Me.

14th.—Duluth, Minn.

17th.—Cresco, Iowa; Mackinaw City, Mich.; Fort Assinaboine, Mont.

18th.—Fort Madison, Iowa; Delavan, Embarras, and La Crosse, Wis.; Grand Haven, Mich.; Bismarck and Fort Totten, Dak.

19th.—Bismarck, Dak.; Poplar River, Mont.

20th.—Webster, Dak.

21st.—Egg Harbor City, N. J.

22d.—Windsor, Ill.; Poplar River, Mont.

23d.—Quakertown and Dyberry, Pa.; Cambridge (aurora suspected) and Blue Hill Observatory, Mass.; Beverly, Clayton, Moorestown, N. J.; Independence, Iowa; North Colebrook, Voluntown, and New Haven, Conn.; Parkston and Fort Totten, Dak.; Berlin Mills, Nashua, and Mount Washington, N. H.; Prairie du Chien, Wis.; Northfield, Vt.; Poplar River, Mont.

24th.—Orono and Bar Harbor, Me.; Independence and Cresco, Iowa; Parkston and Fort Totten, Dak.; Berlin Mills and Mount Washington, N. H.; Northfield, Vt.; Grand Haven, Mackinaw City, and Port Huron, Mich.; Moorhead and Saint Vincent, Minn.; Fort Custer and Poplar River, Mont.

25th.—Newport and Northfield, Vt.; Monticello, Iowa; Windsor, Ill.; Poplar River, Mont.

26th.—Duluth, Minn.

31st.—Northfield, Vt.

THUNDER-STORMS.

Thunder-storms are reported to have occurred in the various states and territories as follows:

Alabama.—6th, 11th, 13th, 14th, 17th to 19th, 21st, 23d to 26th, 29th, 31st.

Arizona.—18th, 25th to 27th, 29th, 30th.

Arkansas.—2d, 4th, 9th, 10th, 12th, 14th to 17th, 22d to 26th, 28th to 31st.

California.—6th, 14th to 16th, 18th to 20th, 22d, 26th, 29th to 31st.

Colorado.—3d, 13th to 16th, 18th, 21st to 23d, 26th to 28th, 31st.

Connecticut.—6th, 7th, 25th, 26th.

Dakota.—1st, 2d, 7th to 9th, 11th to 14th, 20th to 23d, 25th to 28th.

Delaware.—25th, 28th.
District of Columbia.—5th to 7th, 24th to 26th.
Florida.—5th to 14th, 18th, 20th to 24th, 26th to 31st.
Georgia.—5th, 8th to 12th, 18th to 21st, 23d to 26th, 30th, 31st.
Idaho.—24th.
Illinois.—1st to 5th, 9th, 10th, 12th to 17th, 21st to 24th, 29th to 31st.
Indiana.—1st to 6th, 10th to 13th, 17th, 21st to 24th, 30th, 31st.
Indian Territory.—9th to 12th, 14th to 16th, 20th to 24th, 26th, 27th.
Iowa.—1st, 2d, 9th to 15th, 21st, 22d, 26th, 29th.
Kansas.—1st, 10th to 16th, 20th to 28th.
Kentucky.—1st, 3d to 8th, 10th to 14th, 17th, 22d to 26th, 30th, 31st.
Louisiana.—3d, 8th, 10th to 13th, 15th, 17th to 19th, 23d, 27th to 31st.
Maine.—23d, 26th, 27th.
Maryland.—3d to 8th, 24th to 26th, 28th.
Massachusetts.—6th to 8th, 22d, 25th to 28th.
Michigan.—1st to 3d, 5th, 8th, 9th, 11th, 16th, 17th, 20th to 25th, 29th to 31st.
Minnesota.—1st, 5th, 19th, 20th, 23d, 28th to 30th.
Mississippi.—19th, 26th, 29th, 30th.
Missouri.—1st to 4th, 10th to 17th, 21st, 22d, 24th to 27th, 29th.
Montana.—19th, 20th, 27th, 30th, 31st.
Nebraska.—6th, 11th to 16th, 20th to 27th.
Nevada.—17th to 19th, 23d, 24th, 30th, 31st.
New Hampshire.—10th, 18th, 25th to 27th.
New Jersey.—3d, 5th to 8th, 11th, 24th to 29th.
New Mexico.—15th to 18th, 20th, 25th to 27th.
New York.—1st to 3d, 5th to 8th, 19th, 24th to 28th.
North Carolina.—6th to 10th, 12th, 13th, 19th to 21st, 23d to 27th, 31st.
Ohio.—1st to 13th, 21st to 25th, 30th, 31st.
Oregon.—17th, 18th, 22d to 24th.
Pennsylvania.—1st to 3d, 5th to 8th, 11th, 21st, 24th to 28th, 30th.
South Carolina.—5th to 13th, 18th to 20th, 22d to 26th, 30th, 31st.
Tennessee.—2d to 4th, 6th to 10th, 12th, 15th to 26th, 29th to 31st.
Texas.—1st to 3d, 8th to 31st.
Utah.—11th, 18th, 20th.
Vermont.—10th, 25th to 27th, 30th.
Virginia.—6th to 10th, 12th, 19th, 20th, 23d to 26th, 28th, 30th.
Washington Territory.—7th.
West Virginia.—4th, 6th, 7th, 9th, 12th, 20th, 21st, 23d to 26th, 30th, 31st.
Wisconsin.—2d, 13th, 14th, 21st to 23d, 29th, 30th.
Wyoming.—11th, 12th, 15th, 18th, 24th, 27th, 31st.

OPTICAL PHENOMENA.

HALOS.

The following may be stated in regard to halos observed during May, 1887:

From the 1st to the 6th solar and lunar halos were quite generally reported from all districts east of the Mississippi, the stations reporting lunar halos being much more numerous than those reporting solar halos. During the greater part of this period the storm described as number ii under "Areas of low barometer" was advancing from the lower Rio Grande valley to northern Illinois, the halos being observed to the east and south of an area of complete cloudiness, and in the region in which cirrus and cirro-stratus clouds were generally observed.

During the period from the 6th to 13th but few solar or lunar halos were reported, and those observed were noted mostly at scattering stations to the west of the Mississippi River and in the Pacific coast districts.

On the 14th solar halos were observed in California, Oregon, and Idaho, and also in Kansas, to the east of an area of complete cloudiness covering portions of Colorado, Kansas, and Indian Territory.

Solar halos were observed on the 15th in California, Nevada, Arizona, Indiana, and New York, and on the 16th at scattering stations in the Lake region. The period from the 17th to 25th was one during which but few halos were seen, and those at scattering stations to the west of the Mississippi.

On the 26th solar halos were reported from the north Pacific coast, and lunar halos from Illinois, Indiana, and Ohio.

Both solar and lunar halos were reported on the 28th from numerous stations in the Mississippi Valley, and on the 29th from the Lake region, Ohio Valley, and south Atlantic states; these were followed on the 29th and 30th by the cloudy and rainy weather which attended the storm described as number x under "Areas of low barometer."

The phases of the moon, Washington mean time, during May, as given in "The American Ephemeris and Nautical Almanac" for 1887, are as follows: New moon, 22d, 5 h. 57.3 m.; first quarter, April 30th, 5 h. 52.1 m.; full moon, 6th, 20 h. 53.3 m.; last quarter, 14th, 3 h. 9.3 m.; perigee, 5th, 1.2 h.; apogee, 17th, 0.9 h.

MIRAGE.

Fort Stanton, N. Mex.: a mirage was observed at sunset on the 19th; the Sierra Blanco Mountains, lying west of here, were plainly seen outlined in the base of a large cumulus cloud in the southeast.

Mirages were also reported to have been observed at the following places:

Parkston, Dak., 1st, 3d, 20th, 24th, 28th; Webster, Dak., 9th, 18th; Salina, Kans., 23d to 25th; Reidsville, N. C., 20th; Spartanburg, S. C., 15th.

MISCELLANEOUS PHENOMENA.

FOREST AND PRAIRIE FIRES.

Owing to the small amount of rainfall in April and May, 1887, over a large part of the country, prairie and forest fires have prevailed to great extent. These fires have caused the destruction of property of immense valuation, especially in the lumber regions of Michigan, where the losses are estimated at millions of dollars.

Heavy losses have also resulted from forest fires in Massachusetts, New York, Pennsylvania, Wisconsin, and Dakota.

Of the reports received concerning the forest and prairie fires of May, 1887, the following are given:

Dakota.—Grand Forks, Grand Forks Co., 9th: a fierce prairie fire burned over a considerable area fifteen miles north of this place, endangering the settlements in that region. A large elevator of the Minneapolis and Northwestern Elevator Company was destroyed.

Minnesota.—Saint Vincent, 7th: at 11.40 a. m. a gale set in from the south; at the same time extensive prairie fires were

noticed on the southern horizon. The wind continued from the south during the day, causing the fire to make great progress; everything in its path, which is estimated to be about ten miles in length, was consumed; several dwellings, with outbuildings, were burned, together with many hay-stacks, farming implements, etc.

Brainerd, Crow Wing Co.: the forest fires which destroyed large areas of pine timber along the Mississippi eastward from Brainerd, were extinguished by the rain on the night of the 13–14th.

Michigan.—The Signal Service observer at Marquette reports as follows:

On nearly every day from the 5th to 24th the atmosphere was filled with smoke from forests fires to the south. On the 12th the fires extended along the Mackinaw division of the South Shore Railroad from Sand River to Reedsborough, a distance of fifty miles. On the 18th and 20th high westerly winds, attaining a maximum velocity of twenty-two miles per hour, caused the flames to spread rapidly and approach within two miles of Marquette. On the 22d a high southwest wind was accompanied by light rain from 1.08 to 1.40 p. m., but the precipitation produced no effect upon the fire, which at that time covered miles of country. Light rain fell during the night of the 23d–24th, in the afternoon of the 24th and until 9.30 p. m. of the 25th, effectually quenching the fires in this section.

Escanaba: from the 6th to the 22d no rain fell; during this time forest fires were burning over the surrounding country and the air was filled with smoke, which at times was so dense as to seriously affect the navigation on this end of the lake. On the 22d light rain fell for several hours, and heavy rain during the nights of the 22–23d and 23d–24th, completely extinguishing the fires, which had by this time spread over a large part of the upper peninsula and destroyed a vast amount of timber and other property.

Grand Haven, 12th: forest fires are burning in the Cadillac district, one hundred miles northeast of station.

Cheboygan, Cheboygan, Co., 15th: a dense smoke, caused by forest fires, covers this section. The fires are raging in the southern part of this county where much valuable timber has been destroyed.

The following is from the "New York Sun" of May 16, 1887:

MARQUETTE, MICH., *May* 14.—The fog horn here has sounded for three days and three nights continuously, and is still at it. Dense smoke covers the shores and lake. The forest fires are widespread, and cover every quarter of the peninsula. There has been no wind at all for three days, but to-day it is blowing very fresh from the south, and reports of losses will probably pour in to-night. Several towns have been saved with difficulty. A force of men are fighting fire all over the peninsula. Much valuable pine has been destroyed. Everything is terribly dry in this city and vicinity. There are no fires within eight miles of Marquette.

The "Buffalo Commercial Advertiser" of May 28, 1887, contained the following:

CHICAGO, *May* 28.—The Marquette correspondent of the "Times," in a dispatch about the forest fires, says a careful estimate puts the total loss at $7,000,000, including $2,500,000 caused by the destruction of the town of Lake Linden. Eight lives are positively known to have been lost. Great destitution prevails throughout the burned district.

New York.—Catskill, Green Co., 6th: on this date an extensive fire, which originated near Palenville, destroyed much timber and caused great alarm at the hotels in the Catskill Mountains. One man was fatally burned and several persons were burned more or less seriously.

The following is from the "New York Tribune" of May 24:

KEATING, N. Y., *May* 23.—The protracted dry spell has reduced the woods in this section of the country to the condition of tinder, and as a result a most disastrous forest fire is raging. Last week a spark started a fire near Liberty Station, on the Buffalo, New York, and Philadelphia Railroad, which has been increasing in fury ever since and is now entirely beyond control. George D. Briggs has lost nearly 4,000,000 feet of logs, cut and peeled and ready for the mill, besides acres of standing timber. It will require a heavy rain to check the progress of the flames.

Bolton, Warren Co.: on the 26th and 27th one of the most extensive forest fires of many years occurred in the vicinity of Buck Mountain. Owing to the drought which prevailed during the month the timber and undergrowth were very dry and the flames spread rapidly.

Pennsylvania.—Wellsborough, Tioga Co.: from the 10th to the 20th quite extensive forest fires were burning over the southeastern part of this county; but little damage was done, except one hundred and fifty cords of wood and a small quantity of bark, for tanning purposes, were destroyed.

Clarion, Clarion, Co.: on the 22d forest fires were burning in several places near this town and caused considerable damage to timber, especially pine.

Altoona, 22d: a telegram was received in this city this evening from Houtzdale, Clearfield Co., stating that forest fires were raging all around them, and that the town was in imminent danger of destruction.

Maine.—Portland, 12th: a large tract of land has been been burned over near Yarmouthville, Cumberland Co., causing damage to the extent of seven thousand dollars.

Massachusetts.—Wood's Holl: on the afternoon of the 12th the atmosphere was filled with dense smoke from forest fires, which were burning in Barnstable county, near the towns of Bourne, Wareham, Sandwich, and Falmouth. The fires continued until the 14th, burning over nearly ten thousand acres of woodland, and entailing a loss of $30,000. The fire is supposed to have been started by sparks from a locomotive on the Old Colony Railroad.

Milford, Worcester Co., 12th: a forest fire has in two days burned over 2,000 acres of sprout land in this vicinity.

Sandwich, Barnstable Co., 12th: forest fires burned over several thousand acres in this county on the 11th and 12th. The path of the fire was about ten miles in width and fifteen miles in length.

Forest or prairie fires occurred also at the following places: Fort Bowie, Ariz., 3d; North Platte, Nebr., 6th, 9th, 12th; Saint Vincent, Minn., 9th to 11th, 13th; Yankton, Dak., 11th; Harvard, Nebr., 17th; Clayton, N. J., 12th.

INSECTS.

Reports from Columbia, S. C., on the 22d, stated that numerous villages and towns in the eastern part of the state were infested with caterpillars which have caused much injury to trees and shrubbery. The insects are reported to have been of a different variety from those which have usually appeared at this time of the year. On the Atlantic Coast Line Railroad the rails on the trestles over the Great Pedee swamps were so covered with caterpillars as to impede the progress of trains and make it necessary that the rails be swept.

Dayton, Ohio, 23d: potato bugs are to be found in great numbers in this vicinity, portions of some farms being literally covered with them.

Quakertown, Bucks Co., Pa., 26th: potato bugs are numerous in this vicinity; other insects have caused injury to currant and gooseberry bushes.

Yates Centre, Woodson Co., Kans., 31st: chinch bugs very numerous during the month and caused great damage to corn.

Harvard, Clay Co., Nebr., 31st: chinch bugs are damaging the crops in this section; barley and wheat are suffering the most serious injury.

Washington City: during the month myriads of caterpillars have appeared on the trees and shrubbery in the parks and throughout the city. These insects have blighted the foliage of trees, etc., to such an extent that the parking authorities and citizens have resorted to pruning and other means of destroying them in order to check their ravages.

METEORS.

Willows, Colusa Co., Cal.: at 8.45 p. m. on the 9th a meteor of unusual brilliancy was observed from a point about two miles east of Willows. The meteor passed so close to the observer that the hissing noise emitted by it frightened the horse he was driving, and the illumination was so bright that the smallest objects on the ground could be distinctly seen.

Monticello, Jones Co., Iowa: a meteor of unusual size was observed, moving from southwest to northeast, at this station at 3 a. m. of the 22d.

The following report is taken from the Rochester "Democrat and Chronicle" of May 28, 1887:

WELLSBURG, N. Y., *May*, 27.—A meteor of extraordinary size fell on the farm of Jas. Harney at Lowmanville, Thursday night. As the stone is buried quite deep it is impossible to tell its exact dimensions. It descent occurred about 11 o'clock at night and was observed by Robert Wells, a farmer, who had just returned from Elmira. Wells was first startled by the brilliancy of the sky, as if there was a prolonged flash of lightning. Then there was a loud hissing sound and he saw a huge ball of fire, which he thought struck near, but it was so dark after the stone fell that he abandoned the effort to find it.

This morning a mysterious pit forty feet across and twenty feet deep was discovered in a ten acre field on Mr. Harney's farm a mile away. The sides have caved in, but an effort will be made to find the meteor, which, from all accounts, is a large one. The Harneys say the house was severely jarrred during the night and think it must have been caused by the meteor striking so near them.

Meteors were also reported during the month as follows:

Limona, Fla., 1st; Logansport, Ind., 6th, 13th; Manatee, Fla., 6th, 15th; Sanford, Fla., and Pekin, Ill., 8th; Factoryville, N. Y., 9th; Marion, Va., 11th; Aiken, S. C., 15th; Woodstock, Md., 16th, 20th; Clayton and Egg Harbor City, N. J., 18th; Nashau, N. H., 19th; New Haven, Conn., 20th; Kalamazoo, Mich., 21st, 22d; Riley, Ill., Elkin, Ky., and Dover, N. J., 23d; Stateburg, S. C., 25th; Omaha, Nebr., 26th; Boisé City, Idaho, 28th; Cleburne, Tex., 30th.

MIGRATION OF BIRDS.

Geese flying northward.—Red Bluff, Cal., 1st, 3d; Tatoosh Island, Wash., 1st to 6th, 8th, 12th, 17th, 18th, 27th, 29th, 30th.

Geese flying southward.—Duluth, Minn., 10th; Fort Custer, Mont., 28th.

Ducks flying northward.—Tatoosh Island, Wash., 1st to 8th, 13th to 15th, 17th, 18th, 24th to 27th, 29th, 30th.

Cranes flying northward.—Rappahannock, Va., 16th, 19th, 21st.

POLAR BANDS.

Polar bands were reported from the following stations:

Napoleon, Ohio, 1st, 2d, 6th, 29th; Wauseon, Ohio, 2d, 12th; Sacramento, Cal., 3d; Archer, Fla., 3d, 4th, 11th, 25th, 28th, 29th; Montrose, Colo., 4th, 17th, 24th, 26th; Nashville, Tenn., 5th; Lead Hill, Ark., 7th; Centreville, Mo., 8th; Ninnescah, Kans., 20th; Blakely, Wash., 22d; Salina, Kans., Fort McDowell and Fort Mojave, Ariz., 26th; Dale Enterprise, Va., 30th; Gardiner, Me., 31st.

SAND STORMS.

Fort Maginnis, Mont.: at 9 p. m. of the 7th the air was filled with dense clouds of sand, rendering it almost impossible to face the wind. At 4 p. m. of the 10th the wind was blowing a gale and the air became so densely filled with sand that the sun appeared like a large ball.

Saint Vincent, Minn., 2d: at 6.35 a. m. a gale set in from the northwest, attaining its maximum velocity, thirty-eight miles from the northwest, at 3.35 p. m., and ending at midnight. During the afternoon clouds of dust and sand were raised by the wind, rendering travel on foot and in vehicles difficult and uncomfortable, and causing a general suspension of work among farmers and laborers. During the afternoon of the 7th a sand storm occurred, which was more severe than that on the 2d instant; the air was so full of smoke, sand, dust, and burnt prairie grass that persons caught in it could not see ten feet from them.

Sand storms also occurred at the following places:

Pekin, Ill., 2d; Fort Yates, Dak., 10th, 29th; Fort Grant, Ariz., 16th; Yuma, Ariz., 17th, 18th; Fort McDowell, Ariz., 26th, 27th, 29th; Spartanburg, S. C., 27th.

SUN SPOTS.

Mr. John W. James, voluntary observer of the Signal Service at Marengo, McHenry Co., Ill., reports having observed sun spots as follows:

An unusually large spot appeared on the sun's east limb on the 3d; it was on the sun's meridian on the 7th when it had a diameter of 37,800 miles; this spot disappeared by solar rotation on the 13th, and had entirely vanished when due again on the east limb; On the 16th and 17th a large group of spots broke out on the sun's west quadrant, disappearing by solar rotation on the 22d; this group contained two large, and twenty-one small spots, and was estimated to have been 118,000 miles long with a width from one-fourth to one-third as great as the length. No sun spots were seen after the 23d.

Mr. H. D. Gowey, of North Lewisburg, Champaign Co., Ohio, reports sun spots were observed from the 2d to 4th, on the 10th, 13th, 15th, 18th, and from 20th to 27th.

VERIFICATIONS.

INDICATIONS.

The predictions for May, 1887, were made by 1st Lieutenant Robert Craig, 4th Artillery, U. S. Army, Acting Signal Officer and Assistant; the verifications were determined by 2d Lieutenant Frank Greene, Signal Corps, U. S. Army, Assistant, as follows, viz.: for North Carolina and Wisconsin, from May 1st, 7 a. m. to May 14th, 3 p. m., inclusive; for Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, east Florida, lower Michigan, and Iowa, from May 1st, 7 a. m. to May 21st, 3 p. m., inclusive; and for all other states and districts from May 1st, 7 a. m. until May 24th, 7 a. m., inclusive. The remainder of the verifications for the month were determined by 2d Lieutenant John P. Finley, Signal Corps, U. S. Army, Assistant.

The detailed comparison of the tri-daily indications for May, 1887, with the telegraphic reports for the succeeding thirty-two hours, shows the general average percentage of verifications to be 68.51.* The percentages for the different elements are: Weather, 67.83; wind, 66.90; temperature, 69.76. By states, etc., the percentages are: For Maine, 67.59; New Hampshire, 68.20; Vermont, 69.25; Massachusetts, 69.26; Rhode Island, 66.14; Connecticut, 68.30; eastern New York, 71.08; western New York, 69.29; eastern Pennsylvania, 67.07; western Pennsylvania, 71.25; New Jersey, 67.64; Delaware, 64.43; Maryland, 67.76; District of Columbia, 64.96; Virginia, 69.55; North Carolina, 68.32; South Carolina, 68.27; Georgia, 69.55; eastern Florida, 64.06; western Florida, 64.11; Alabama, 66.76; Mississippi, 67.90; Louisiana, 70.78; Texas, 76.08; Arkansas, 63.03; Tennessee, 63.44; Kentucky, 72.06; Ohio, 73.16; West Virginia, 74.65; Indiana, 72.11; Illinois, 71.05; lower Michigan, 73.51; upper Michigan, 65.48; Wisconsin, 66.05; Minnesota, 65.70; Iowa, 69.78; Kansas, 67.19; Nebraska, 75.65; Missouri, 66.75; Colorado, 69.11; eastern Dakota, 70.24; Washington Territory, 74.65; Oregon, 74.12; northern California, 80.39; southern California, 83.90.

There were ten omissions to predict, out of 8,529, or 0.12 per cent. Of the 8,519 predictions that have been made, seven hundred and seventy-six, or 9.11 per cent., are considered to have entirely failed; six hundred and fifty-eight, or 7.72 per cent., were one-fourth verified; 1,971, or 23.14 per cent., were one-half verified; 1,827, or 21.45 per cent., were three-fourths verified; 3,287, or 38.58 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

*In determining the general average percentage of verifications the Pacific coast districts have not been included.

CAUTIONARY SIGNALS.

Of the total number of signals ordered during May, 1887, it was practicable to determine the verifications of thirty-two; of these, twenty-four, or 75.00 per cent., were fully verified both as to direction and velocity. No direction or on-shore signals were ordered during the month. Number of signals

ordered late, *i. e.*, after the verifying velocity had begun, one, or 3.00 per cent.

In addition to the above, fifty-five signals were ordered at display stations, the verifications of which it was impracticable to determine.

In twenty-seven instances winds were reported which would have justified the display of cautionary signals, but for which no signals were ordered, and in twenty-eight instances winds which would have justified the display of on-shore signals, but for which no signals were ordered.

COLD-WAVE SIGNALS.

Total number of cold-wave signals ordered, the verifications of which were determined, twenty; verified, seventeen, or 85.00 per cent. Three signals were ordered, the verifications of which it was impracticable to determine.

LOCAL VERIFICATIONS.

The following is from the report of the "Michigan State Weather Service" for May, 1887:

Weather and temperature signals were displayed in one hundred and twelve cities and towns and on the Chicago and Grand Trunk Railway; Detroit, Grand Haven and Milwaukee Railway; Detroit and Port Huron Division Grand Trunk Railway; and the Port Huron and Northwestern Railway. The percentage of verifications was 81.5 on weather, and 77.9 on temperature, predictions. There are many towns ready to display signals after July 1st, when they can be supplied with indications by telegraph.

One cold-wave signal was displayed during the month. The order was received at 11.15 a. m. of the 2d, and the minima temperatures in the state on the morning of the 4th were from 28° to 45°.

The following is from the May, 1887, report of the "Minnesota Weather Service:"

Verifications of weather signals for Minnesota were 73 per cent. for weather and 89 per cent. for temperature; for eastern Dakota, 75 per cent. for weather and 90 per cent. for temperature; for northern Iowa, 81 per cent. for weather and 85 per cent. for temperature.

The following is from the May, 1887, report of the "South Carolina Weather Service":

The percentage of verification of the weather and temperature predictions for the whole state was: for weather, 69.2 per cent.; for temperature, 86.0 per cent.

The following is from the May, 1887, report of the "Tennessee State Board of Health Bulletin":

The percentage of verification of the temperature and weather predictions during the month at Nashville and Clarksville were as follows: Nashville, temperature, 83.9 per cent.; weather, 77.4 per cent.; Clarksville, temperature, 93.3 per cent.; weather, 66.6 per cent.

ERRATA.

In the REVIEW for March, page 79, under "Monthly snowfalls," that for Yellow Springs, Ohio, given as 9.3 inches, should read 0.8 inch; and under "Depth of snow on ground at end of month," on same page and for same station, the depth given as 0.8 inch should not have been published; there was no snow on ground at the end of the month at Yellow Springs.

STATE WEATHER SERVICES.

The following extracts are republished from the reports for May, 1887, of the directors of the various state weather services:

The "Alabama Weather Service," P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn, director:

The temperature during the month has been mild and beneficial to vegetable growth. No sudden and injurious changes have been reported from any station. The average temperature for the state was normal.

The rainfall for May was below the normal 1.53 inches. The distribution, however, has been so uniform and precipitations so frequent the condition of the crops has been very materially improved over that reported in the April bulletin. Farmers are very much encouraged with the outlook and, with the exception of the oat crop, anticipate a full yield from all plantings.

The spring months just closed furnish an average temperature of 64°, which is 1°.1 below the normal. The total precipitation for the same period was 7.02 inches, falling below the normal 10.98 inches.

Summary.

Mean temperature, 73°.6; highest temperature, 99°, at Roanoke, on the 9th; lowest temperature, 40°, at Gadsden, on the 1st; range of temperature, 59°; greatest monthly range of temperature, 53°, at Gadsden; least monthly range of temperature, 20°, at Moultrie; mean daily range, 17°.8; greatest daily range of temperature, 52°, at Gadsden, on the 1st; least daily range of temperature, 1°, on the 25th, at Trinity.

Mean depth of rainfall, 2.85 inches; mean daily rainfall, 0.092 inch; greatest depth of monthly rainfall, 6.60 inches, at Marion; least depth of monthly rainfall, 0.91 inches, at Gadsden; greatest daily local rainfall, 2.65 inches, at Livingston, on the 26th.

Average number of days on which rain fell, 10; average number of cloudy days, 7; average number of fair days, 17; average number of clear days, 7.

Warmest day, 17th; coldest days, 1st and 5th.

Prevailing direction of wind, southwest.

The "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, of Springfield, director:

There have been but two spring months in the past thirteen years having a greater degree of heat than that of the past month, May of 1880, with a mean temperature of 68°.1, and May of 1881, with a mean of 69°.1, being these exceptions.

The mean temperature of May, 1887, 67°.4, was 4°.5 above the normal for the past thirteen years. The coolest May in that period being in 1882, with a mean of 58°.1

The mean temperature of the northern division was 65°.2; of the central division, 67°.9, and of the southern division, 69°.9.

The departures above the normal were marked in each of the three divisions, and in but one of the counties reporting (Clay) was the mean temperature a trifle below the normal.

Temperature.—The maximum temperature, 98°, is the highest on record for the month, and the mean temperature was nearly five degrees above the May normal for thirteen years.

There has been a general deficiency of rainfall during the month, notably so in the northern division, where the average for the past spring was over five inches below the spring average for the past ten years. The average rainfall for the central and southern divisions was less than one inch below the normal for May, and was well distributed, falling at opportune times. Thunder-storms were frequent, but few casualties from lightning were reported. Hail fell in certain sections, being reported quite heavy, but without damage to crops.

There were no violent wind or rain storms reported during the month.

Precipitation (inches and hundredths).—A great deficiency for the month is noted for the northern division. The average for the state, 2.94, was 1.24 below the May normal for the past ten years, but the rainfall for the central and southern divisions being only from 0.67 to 0.76 below their respective averages, it it apparent that the bulk of the deficiency noted above is due to the lack of rainfall in the northern division, where the average for the month, 1.77, was 2.09 below the May normal for the past ten years. The average amount in the central division, 3.84, was 0.67 below the May normal, and in the southern division, 3.44, was 0.76 below the normal for the month.

Rain fell on twenty days during May in the northern division, but the amount deposited was inappreciable nearly two-thirds of the time. Prior to the 21st there was barely appreciable rainfall. More moisture was deposited during the general thunder-storm of the 22d than the total for the remainder of the month.

The "Indiana Weather Service," Prof. H. A. Huston, of Purdue University, Lafayette, director:

The temperature was considerably above the normal, 4°.7 for the whole state, the greatest excess being 5°.4 and the least 3°.2. Though the temperature was unusually high, the range was unusually small; the average for the state was only 38°. The lowest recorded was 42°, while at one station, Angola, 100° was recorded, so that the extreme range was 58°.

The precipitation was below the normal, except at Vevay, where it was 0.54 inch above the average of twenty-one years, and Connersville, where it was 1.48 above the average of five years. On the whole the deficiency for the state was from 1 to 2 inches. There were, however, considerable heavy local rains, 2 inches being recorded at Marengo on the 23d, while at Princeton, on the 12th, 1.10 inches fell in twenty-five minutes.

The "Iowa Weather Service," Dr. Gustavus Hinrichs, Iowa City, director:

May, 1887, was very warm and dry, fair to fine weather, and southerly winds greatly prevailing.

The mean temperature of the air was six degrees above normal. During the past seventeen years May has but three times been as warm or warmer, namely, in 1881, 1880, and 1871. During the thirty-two years ending 1870, but twice was it as warm, namely, in 1839 and 1870. In forty-nine years May has thus but six times been as warm as it was this year, and half of this number has occurred during the past eight years.

The first twenty days of May averaged eight degrees above normal; the last

ten days averaged only two degrees above normal. Days exceeding their normal temperature by over ten degrees were the 1st, the nine days from the 8th to the 16th, and the three days from the 20th to the 22d. On only one day (the 30th) did the temperature fall ten degrees below normal.

At the central station we had fourteen clear days, the greatest number ever recorded, and nearly double the normal number. Only four days were cloudy days. The mean cloudiness was only thirty-four per cent., while normally it is fifty per cent. for May.

The air was remarkably dry on many days. The lowest relative humidity was twenty-four per cent., on the 24th at 2 p. m.

The rainfall at the central station was but fifty-five per cent. of the normal. Since 1848 it has been as little or somewhat less eight times before, namely, in 1881, 1880, 1875, 1874, 1871, 1866, 1860, and 1855, or in all, nine times in forty years.

In the state, a belt along the Missouri River, southern and southeastern Iowa received the most rain, namely, two inches, and at a few points as much as three inches. This is about one-half the normal rainfall. Northern Iowa, from Winnebago and Howard counties down to Polk and Iowa counties, received generally only about one-half an inch of rain, being only from one-fourth to one-eighth the normal amount. In the northern counties this small amount of rain did not fall till at the close of the month, when good rains also first favored northeastern Iowa. At Concord, Hancock Co., no measurable rain fell during the entire month. From this northern and central region of lowest rainfall to the west, south, and southeast, the rainfall gradually increased to the amount already specified.

It thus appears that only the northern and central portions of Iowa specified have suffered from drought. This affects small grain, hay, and grass only, as corn can easily make up when rain comes in June.

The only days on which rain was nearly general for the state were the 1st, 13th, 21st, 29th, and 31st, of which, all but the last were also noted by thunderstorms. In all, rain fell on nineteen days of the month in Iowa, and yet the month was very dry, most of these rains being very local and very light.

No destructive storms occurred. Lightning killed several persons and some stock, also destroyed some buildings. Hail did some damage in Emmett and Bremer counties (1st), also near Sioux City (26th), and in Johnson county (29th). The only really heavy rain storm occurred in Henry county on the afternoon of the 14th, giving two inches and a half of rain at Mount Pleasant.

No damaging frosts occurred this month. Light hoar frosts were seen in the west on the 3d and 4th, and in the north on the 18th. Fog on the 6th in northern-central Iowa, and on the 7th in middle-eastern Iowa.

The northern lights were noted on the 18th at four stations, and on the 24th at two stations.

On the whole, the season is greatly ahead in temperature and much behind in rainfall; but as we approach the normally abundant June rains, and as rain in May has been far from uncommon, no fears are justifiable.

The "Kansas Weather Service," Prof. J. T. Lovewell, Topeka, director:

The temperature has ranged about 2°.0 above the May average over the state. Although the rainfall has been deficient over the middle and eastern divisions yet it has been so well distributed throughout the month as to have the corn in excellent condition.

The "Michigan Crop Report" (the state weather service is in charge of N. B. Conger, Sergeant, Signal Corps, at Lansing):

Temperature.—The mean temperature for this month, 61°.4, is 8°.2 above the normal. The normal for the central and southern counties is 56°.2, while the mean for this month has been 6°.7 above the normal.

High temperatures were recorded generally in the state on the 21st, in most cases above 90°. The temperature after the 21st was lowered by the general rains which occurred from the 23d to the 31st.

Precipitation.—The mean rainfall for the month, 2.40 inches, is 0.77 inch below the normal, and the maximum portion of this fell on the last nine days of the month. The average precipitation for the state from the 1st to the 22d, inclusive, was 0.63 inch, so that the average rainfall for the remaining nine days was 1.77 inches. The period from the 1st to the 22d covers the dry season, up to the date on which general rains fell throughout the state.

The counties of Berrien, Cass, Clinton, Gratiot, Ingham, and Kalamazoo record considerable rain on the 17th, but these are the only counties that had sufficient rain during this period. Oceana county reports record no rainfall until the 23d.

Summary.

Mean monthly temperature, 61°.4; highest temperature, 97°.1, on the 9th, at Grayling; lowest temperature, 28°, on the 4th, at Grayling, and on the 18th, at Gaylord; monthly range of temperature, 69°.1; greatest range of temperature, 69°.1, at Grayling; least range, 33°.0, at Benton Harbor.

Average precipitation, 2.40 inches; average number of clear days, 14.8; average number of fair days, 11.7; average number of cloudy days, 4.5; average number of rainy days, 8.4.

Prevailing direction of the wind, southwest; maximum velocity of the wind and direction, thirty-nine miles, south, at Grand Haven.

The "Minnesota Weather Service," Prof. Wm. W. Payne, Carleton College, Northfield, director:

The dominant features of the month were an abnormally high temperature, and a deficiency of precipitation in the southern counties. For the first week of the month the temperature and rainfall were slightly in excess; for the second and third weeks the temperature was above and the precipitation below the average; from the 22d to 31st, both the temperature and precipitation was slightly deficient. By May 7th the wheat was nearly all sown in Minnesota and Dakota and under conditions more favorable than for several years. The ground was in excellent condition before seeding was begun, as the snow, which disappeared slowly, sank into the ground and timely rains which followed assisted in keeping it damp. At the close of the month the conditions of the soil and climate were generally favorable for the crops.

Temperature.—May, this year, takes precedence over nearly all other terminal spring months, of which there is a record in this state, for a high mean and maximum temperature; in 1881, the mean at a few stations equaling that of this year. Some of the very high maxima temperatures, and which occurred on the 10th, were: Sherburne and Saint Vincent, 96°.0; Moorhead, 95°.5; Spring Valley, 95°.0; Grand Forks, 93°.0. Some of the minima, and which occurred on the 17th, were: Saint Vincent, 24°.8; Moorhead, 25°.1; Grand Forks, 26°.0. It is notable that both the maxima and minima temperatures were reported from the northwestern portion of the state. The low temperatures on the 2d, 3d, 16th, and 17th caused killing frosts in some localities, but the damage to crops was hardly appreciable. The mean temperature for the state is 61°.7, which is 2°.8 above that of the corresponding month of 1886, and 6°.9 above that of 1885. The mean is abnormally high at all stations where records have been kept for a number of years, excepting at Duluth, where it is normal. The departures amount to about five degrees in the western and southern portions of the state. The monthly range of temperature for the state is 71°.2, which is the same as that for Saint Vincent; the greatest ranges were reported from the Red River Valley, while the least were in the northeastern counties near Lake Superior; the least range was 45°.3 at Duluth.

Precipitation (in inches).—The average for the state was 1.78, being 0.27 above that of May, 1886. There was a decided deficiency, except in the northern portion of the state, where there was an excess of about an inch. At Saint Paul the rainfall was 1.6 below the average, while at La Crosse it was 2.5 below, the amount which fell at the latter station being less than that for any corresponding month since the station was established in 1873. Some of the lowest rainfalls reported were La Crosse, Winona, and Litchfield, 0.50; Albert Lea, 0.71; Red Wing, 0.99. Some of the heaviest reported were: Duluth, 4.93; Pokegama Falls, 3.79; Saint Vincent, 3.57; Grand Forks and Moorhead, 2.57. The dates of general precipitation were the 1st, 2d, 13th, 14th, 21st to 24th (inclusive), and the 29th to 31st. Stations reporting over an inch of rainfall during any twenty-four hours, with the amounts, were: Duluth, 1.35, 1st, and 1.93, 2d; Pokegama Falls, 1.02, 24th; Rolling Green, 1.40, 13th; Grand Forks, 1.24, 29th.

The prevailing direction of the wind, south.

The "Mississippi Weather Service," Prof. R. B. Fulton, of the University of Mississippi, Oxford, director:

Summary.

Mean temperature, 74°.0; highest temperature, 95°.0, at Jackson, on the 13th, and Brookhaven on the 11th; lowest, 30°.0, at Lake, on the 5th; range of temperature, 65°.0.

Mean depth of rainfall, 3.05 inches; greatest monthly rainfall, 8.75 inches, at Okolona; least monthly rainfall, 0.27 inch, at Port Gibson. Average number of days on which rain fell, 7.6.

The "Missouri Weather Service," Prof. Francis E. Nipher, of Washington University, Saint Louis, director:

At the central station (Saint Louis) the temperature of May has been 70°.6, which is 4°.3 above the normal. The highest temperature, 86°.5, on the 1st, and the lowest was 52°.1, on the 5th. The rainfall, 4.75, is the normal rainfall for May.

The highest temperatures reported from the state were 95°.0, at Mound City; 93°.0, at Miami and Pro Tem; 92°.0, at Kirksville, Louisiana, and Sedalia; and 91°.0, at Fayette and Oregon.

The greatest amount of rain fell in the central, southern, and eastern parts of the state, where the fall was from 4.00 to over 5.00 inches. The highest fall occurred at Pro Tem, it being over 8.00 inches, and the lowest at Kirksville, 1.17 inches. At Cairo the fall was only 1.37 inches.

The "Nebraska Weather Service," Prof. Goodwin D. Swezey, of Doane College, Crete, director:

Precipitation.—The distribution of rainfall for the month is very equal. Two regions, the extreme northwestern part of this state, and another in the valley of the Big Blue have received over five inches, while the central and northeastern portions have received very little, one station reporting but fourteen-hundredths of an inch; its distribution throughout the month has also been very poor, most of it coming in one or two heavy rains, so that the number of rainy days is less than usual.

The average rain for the different sections of the state for May, 1887, is as follows: northeast section (four stations), 1.09 inches; north-middle (two stations), 1.37 inches; west (one station), 5.87 inches; south-middle (four stations), 1.41 inches; southeast (covering essentially what has heretofore been the "whole state" as far as reporting), 3.04 inches; state average, by sections, 2.56 inches.

Temperature.—The average temperature for southeastern Nebraska is 3°.4 below the normal, and both the highest and lowest temperatures of the month have exceeded those of May of the previous nine years.

Weather signals.—The distribution of weather predictions, as explained in our last report, is being regularly made from this office to all accessible points desiring them. Thirty-nine stations are now receiving the daily 10 a. m. predictions, and a considerable number of them are displaying flags. The others are posting the bulletins in the post-office. Very general satisfaction is expressed with the system.

The "New England Meteorological Society," Prof. Wm. H. Niles, of the Institute of Technology, Boston, Massachusetts, president:

Reports for the month were received from one hundred and forty-nine observers.

The month was unusually dry and warm. The abnormal warmth at several long-record stations is remarkable. The deficiency in precipitation reverses the excess of the previous six months. The dry weather of the first three weeks was followed by sufficient rain to prevent threatened injury to the growing crops, and at the close of the month the fields and gardens were generally in fine condition. The barometric variations were few and slight.

The weather of the month may be considered in four periods: First, fair, warming days from 1st to the 5th; second, light showers on 6th, 7th, and 8th; third, a long dry period from the 9th to the 23d, relieved only by light showers on the 10th and 18th, in the north; fourth, seven days of cloudy and rainy weather from the 24th to 30th, with a fair day or two to close the month.

The "New Jersey Weather Service," Prof. George H. Cook, of the Agricultural College, New Brunswick, director:

The most important feature of the weather during May was the drought. In some counties of the state growing crops suffered and great anxiety prevailed. No storm-centre crossed the borders of the state. The temperature ran high, and, compared with previous records extending over a period of years, the mean average at eleven stations, Atlantic City, Dover, Lambertville, Moorestown, New Brunswick, New York City, Paterson, Philadelphia, Princeton, Somerville, and Sonth Orange, showed an excess amounting to 3°.4.

The rainfall for the month was abnormally low, the least in years, and insignificant when compared with the precipitation of May, 1886. The little that did fall evaporated almost as fast as deposited. Heavy fogs and dews on the coast line were quite frequent, and some observers attribute the saving of their crops to the moisture received in this way alone.

The "North Carolina Weather Service," Dr. Charles W. Dabney, jr., of Raleigh, director:

Atmospheric pressure (in inches).—Mean for May, 1887, 30.01; normal for May, 30.03; deviation from the normal, +.02; highest, 30.42, at Chapel Hill, on the 15th; lowest, 29.53, at Hatteras, on the 27th.

Temperature (in degrees).—Mean for May, 1887, 69.9; normal for May, 66.9; deviation from the normal, +3.0; highest, 95.0, at Maxton, on the 18th; lowest, 32.0, at Salem, on the 6th; highest on record for May, 98.0, at Norfolk, in 1880; lowest on record for May, 37.0, at Lynchburg, in 1876. Average morning temperature, 63.6; normal, 63.6; deviation from the normal, 0.0. Average afternoon temperature, 78.8; normal, 73.3; deviation from the normal, +5.5. Average night temperature, 67.6; normal, 64.5; deviation from the normal, +3.1. Mean of maximum, 89.1; normal mean of maximum, 93.2; deviation from the normal, —4.1. Mean of minimum, 47.6; normal mean of minimum, 40.2; deviation from normal, +7.4. Greatest daily range, 46.0, at Maxton, on 2d; greatest daily range, 33.3, monthly average; least daily range, 4.3, at Raleigh, on 31st; least daily range, 8.0, monthly average; mean daily range, 20.5; greatest monthly range, 59.5, at Salem; least monthly range, 22.9, at Hatteras; mean monthly range, 41.4; absolute range, 63.0.

Warmest days, 8°.0 above normal, on the 4th and 18th; coldest day, 5°.0 below normal, on the 15th; warmest localities, 3.0 above normal, at Lynchburg, Maxton, Chapel Hill, and Knoxville, Tenn.; coldest locality, 2°.0 below normal, at Reidsville, N. C. Normal readings, 9.1 per cent.; abnormally high readings, 70.5 per cent.; abnormally low readings, 20.4 per cent.

Precipitation (in inches).—Average for May, 1887, 4.55; normal for May, 3.76; deviation from the normal, +0.79: daily average, 0.15; greatest monthly rainfall, 8.07, at Weldon; greatest daily rainfall, 6.03, at Weldon, on the 10th.

The "Ohio Meteorological Bureau," Prof. B. F. Thomas, of the Ohio State University, Columbus, president:

The mean temperature was 68°.0. This is our highest May mean, and is 4°.2 above the average and 5°.3 above the normal.

The highest temperature was 97°, our highest for May, and the lowest was 38°. On each of the four preceding years covered by our records, the May minimum was 32°, or lower. The mean daily temperature range was 22°.8, which is also the May average.

The number of clear days was greater than usual.

The mean rainfall was only 2.87 inches. The mean for the middle section of the state was 3.35 inches; for the southern section, 2.87, and for the northern section, 2.79. The greatest mean rainfall occurred at Quaker City, 5.7 inches, and the least, 1.28 inches, at Waverly.

Summary.

Mean temperature, 66°.0; highest temperature, 97°.0, on the 21st, at Pomeroy; lowest temperature, 38°.0, on the 1st, at Youngstown, on the 19th, at Paulding; range of temperature, 59°.0; mean daily range of temperature, 22°.8; greatest daily range of temperature, 46°.0, on the 20th, at Paulding; least daily range of temperature, 4°.5, on the 6th, at Portsmouth.

Average number of clear days, 12.6; average number of fair days, 11.7; average number of cloudy days, 6.7; average number of rain-days, 12.0.

Greatest number of days on which rain fell, 17, at Clarksville, Quaker City, Waynesville; least number, 6, at Gambier, Hanging Rock.

Mean monthly rainfall, 2.87 inches; average daily rainfall, .092 inch.

Prevailing direction of wind, northeast.

The "South Carolina Weather Service," Hon. A. P. Butler, Commissioner of Agriculture for South Carolina, director:

The month has presented no marked meteorological feature. The mean temperature has been about normal. At Charleston the mean temperature was 72°.7, which is also the mean for the last sixteen years.

On the coast the rainfall has been about the average, but in the middle and upper portions of the state it has been less than the average.

As a whole the month has been very favorable for the growing crops. The nights were rather cool for cotton, but this was largely counteracted by the warm sunshine during the days. The rainfall, though deficient, was generally well distributed, and crops were much benefited by the copious rains which occurred at the close of the month.

Summary.

Mean temperature, 72°.5; highest temperature, 97°, at Chester, on the 18th; lowest temperature, 41°, at Chester, on the 1st; range of temperature, 56°; greatest daily range of temperature, 50°, at Chester, on the 1st; least daily range of temperature, 6°, at Newberry, on the 20th and 30th.

Mean depth of rainfall, 3.17 inches; greatest daily rainfall, 2.30 inches, at Charleston, on the 22d. Heavy rains occurred in the upper and middle counties on the 31st. In the lower counties the heaviest rains of the month occurred on the 22d.

Rainfall measurements exceeding one inch in twenty-four hours were reported as follows: 6th, Saint Matthew's, Orangeburg Co., 1.33 inches; 8th, Belfast, Barnwell Co., 1.30 inches; 12th, Greenwood, Abbeville Co., 1.25 inches; 12–13th, Columbia, Richland Co., 1.49 inches; 14th, Branchville, Orangeburg Co., 1.55 inches, and Yemassee, Beaufort Co., 1.32 inches; 22d, Jacksonborough, Colleton Co., 1.19 inches; Yemassee, Beaufort Co., 1.02 inches; Charleston, Charleston Co., 2.30 inches; 23d, Branchville, Orangeburg Co., 1.02 inches; Florence, Darlington Co., 1.83 inches; 31st, Abbeville, Abbeville Co., 1.08 inches; Anderson, Anderson Co., 1.00 inch; Brewer Mines, Chesterfield Co., 1.45 inches; Newberry, Newberry Co., 1.39 inches.

Least daily rainfall, inappreciable, at several stations, on the 19th and 20th.

Average number of rainy days, 10.2.

The "Tennessee State Board of Health Bulletin," under the direction of J. D. Plunkett, M. D., President of the State Board of Health (the weather report is prepared by H. C. Bate, Director of the State Meteorological Service):

The meteorological conditions for May show few departures from the normal.

The mean temperature was 70°, slightly above the average of the five years past. The highest temperature was 93°, recorded on the 9th, and was 1° below the maximum for May in 1885, which was the highest for the corresponding period in five years. The lowest temperature was 44°, recorded on the 28th, and was the highest minimum for May in the five years, the next highest being 39°, in 1884. The monthly range of temperature was the least for the period above mentioned.

The mean precipitation for the month was 3.53 inches, slightly below the average for May in the past five years, the greatest amount being 4.42 inches, in 1886. Of this amount, the eastern division received by far the largest portion, having an average of nearly five inches, the middle division receiving an average of about three and a quarter inches, while the western division received less than two and a half inches.

The rains were numerous but generally light, and many of them local. Those of the 5th, 7th, 10th, 13th, 25th, 26th, 30th, and 31st were general rains. Many of the rains were accompanied with severe electrical disturbances, and some with hail and wind, but no great amount of damage was reported. The days of the greatest rainfall were the 5th, 6th, 25th, 30th, and 31st, the last named having the greatest fall during the month. Notwithstanding the proportionately low average of rainfall, there were only three or four days reported free from a measurable quantity of rain in any part of the state. The greatest rainfall was 6.57 inches, reported at Chattanooga, and the least was only 0.76 inch, reported at Beech Grove. The greatest local daily rainfall was 2.50 inches, reported on the 31st at Grief; the next greatest was 2.49 inches, on the 25th, at Hurricane Switch. There were other heavy local daily rainfalls during the month. No frosts were reported during the month, quite an unusual thing, as the first decade is usually marked by severe frosts in some portions of the state. This, together with the heavy dews supplementing the rains, and a fair proportion of sunshine, and the absence of any very unfavorable conditions, rendered the month quite favorable for the growing crops.

Summary.

Mean temperature, 70°.0; highest temperature, 93°, on the 9th, at Dyersburg; lowest temperature, 44°, on the 28th, at Farmingdale; range of temperature, 49°; mean monthly range of temperature, 34°.8; greatest monthly range of temperature, 43°, at Farmingdale; least monthly range of temperature, 28°, at Careyville and Florence Station; mean daily range of temperature, 18°.2; greatest daily range of temperature, 36°, on the 1st, at Fostoria, and on the 14th, at Austin; least daily range of temperature, 4°, on the 18th, at Beech Grove and Covington, on the 25th, at Vernon and on the 26th, at

Fostoria; mean of maximum temperatures, 88°.7; mean of minimum temperatures, 53°.9.

Average number of clear days, 12.3; average number of fair days, 12.3; average number of cloudy days, 6.4; average number of days on which rain fell, 11.6.

Mean depth of rainfall, 3.58 inches; mean daily rainfall, 0.114 inch; day of greatest rainfall, 31st.

Days without rainfall, 1st, 15th, 28th.

Warmest day, 9th; coldest day, 28th.

Prevailing winds, south and southwest.

NOTES AND EXTRACTS.

FOG PREDICTIONS FOR THE BANKS OF NEWFOUNDLAND.

[By Sergeant E. B. GARRIOTT, Signal Corps.]

This subject was briefly discussed in the MONTHLY WEATHER REVIEW of March and April, 1887. Shipmasters have generally responded to requests for special reports relative to fog-banks, and data received has admitted of fuller and more satisfactory investigations in connection with these phenomena.

The atmospheric conditions requisite to the development of fog are too well known to require discussion; suffice it to say that these conditions are more marked and more frequently exist over the Banks of Newfoundland than in any other locality within the usual routes of travel. The prevailing winds in this region are westerly, and the differences in temperature between air drawn from the continent and that which overlies the ice-fields and the cold Arctic currents are not, as a rule, sufficiently great to cause a large precipitation of fog-atoms. It is therefore evident that the denser fog formations are due to meteorological conditions whereby greater ranges in air temperatures are occasioned. The element of cold air is constant in this region and the opposing element of warm air is ever present over the ocean to the southward and over the Gulf Stream which flows from the southwestward over the southern edge of the Banks. The causes which influence the flow of warm air from the southward and from over the Gulf Stream are necessarily due to meteorological conditions whereby the prevailing westerly winds are diverted to the southern or eastern quadrants. The causes whereby these conditions are developed are traceable to cyclonic areas which pass eastward over the ocean from the continent. All reports of fog encountered in the vicinity of the Banks verify these conclusions, and it now remains to determine how this knowledge can best be utilized for the benefit of shipmasters.

For purposes of fog predictions it is advisable to consider only the storms which leave the American coast north of the thirty-fifth parallel, both by reason of the fact that they generally pass over, or in close proximity to, the Banks of Newfoundland, and on account of the facilities offered by telegraphic land reports for foreseeing their probable course from the interior or western portion of the continent. Following the appearance of a storm-area in the central valleys of North America, a minimum period of about three days is commonly allowed for its advance to the Maritime Provinces, at the expiration of which time the conditions favorable for fog would commence to develop over the Banks, and would continue about two days, or until the passage of the depression had caused the wind to again shift to westerly. This calculation allows a period of at least five days between the appearance of a cyclonic area over the interior of the continent and the time of greatest probable fog density over the Banks as resulting from its eastward movement. With this margin of time allowed forecasts of great interest and value could be made for the benefit of the shipping interests. Outward bound steamers could be forewarned of the probable presence of fog over the Banks in season to anticipate its presence on arrival in that locality, and vessels about to sail from British ports could have seasonable warning by cable. In cases of abnormal and unexpected rates of progression of storm-areas, or of rates of speed, on the part of vessels, insufficient to reach these longitudes in the time prescribed, a knowledge by shipmasters of the laws governing the circulation of winds within areas of low barometric pressure, and of the fact that with a shift of wind to the northwest quadrant, following the passage of a storm-centre, the fog-banks would dissipate, would enable them to determine, upon approaching the Banks, whether the anticipated conditions had developed or disappeared. If easterly or southerly winds and falling barometer were noted, it would indicate that the centre of the low barometric area was still to the westward, and fog might be expected; if, on the contrary, the wind had commenced to shift to westerly with steadily rising barometer, it would show that the storm-centre had passed to the eastward of the Banks, and an early disappearance of fog in that region might be calculated upon.

This subject is of vital impartance to shipmasters, and will be pursued, not only in connection with the fogs peculiar to the Banks of Newfoundland, but also as relates to those which develop along the American coast in more southern latitudes.

Meteorological record of voluntary observers and Army post surgeons, May, 1887.

The maximum and minimum temperatures at stations marked thus (*) are from readings of other than standard instruments.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation.
Alabama.	°	°	°	*Inches*
Greensborough	88	63	72.4	3.37
Livingston	90	68	75.5	6.42
Mount Vernon B'ks.	94	57	75.4	1.12
Arizona.				
McDowell, Fort	106	45	79.8	trace.
Mojave, Fort	107	47	80.6	0.25
Arkansas.				
Hot Springs	91	55	73.0	6.65
Lead Hill	93	51	70.7	8.57
California.				
Alcatraz Island	92	44	54.0	trace.
Angel Island	103	44	59.4	trace.
Benicia Barracks	101	46	60.8	trace.
Bidwell, Fort	94	22	56.8	1.25
Cahuenga				0.23
Gaston, Fort	107	31	60.1	3.19
Mason, Fort	75	50	57.3	0.14
Nicolaus	102	42	65.5	0.01
Oakland	101	43	57.7	0.10
Oroville	102	39	70.0	0.08
Presidio of San F	94	39	55.6	trace.
Riverside*	90	44	67.4	0.17
Sacramento	99	34	63.0	trace.
Salinas	70	44	54.3	0.07
Willows	112	42	66.1	0.03
Colorado.				
Alma	70	21		
Fort Collins	90	24	57.7	1.23
Colorado Springs	83	29	57 5	2.24
Lewis, Fort	82	15	53.3	0.30
Connecticut.				
North Colebrook	82	32	57.1	0.37
Voluntown	88			2.00
Dakota.				
Abr. Lincoln, Fort	92	31	60.9	1.80
Henry	87	30	60.9	0.90
Highmore	90	15	60.6	
Meade, Fort	88	27	59.8	2.72
Parkston*	98	36	62.9	1.37
Pembina, Fort	97	22	57.0	3.73
Randall, Fort	94	19	65.1	0.31
Richardton	87	32	57.2	3.20
Sisseton, Fort	94	27	60.0	1.86
Sully, Fort	95	33	65.0	1.37
Totten, Fort	90	29	59.3	1.49
Webster	96	29	61.2	1.72
Yates, Fort	92	30	62.3	2.12
District of Columbia.				
Distributing reserv'r	91	57	71.6	2.55
Kendall Green	84	56	70.0	2.11
Receiving reservoir	86	54	71.0	2.13
Rock Creek bridge	90	60	73.6	
Florida.				
Alva*	92	62	71.6	8.55
Archer *	84	52	68.2	3.29
Duke	94	55	71.0	1.37
Fort Meade*	91	65	78.0	1.65
Limona *	90	63	76.3	3.09
Manatee	89	66	77.5	9.69
Merritt's Island	89	51	75.3	2.95
St. Augustine, Fort	90	59	73.7	3.10
Tallahassee				2.80
Georgia.				
Athens	87	51	71.2	3.46
Forsyth*	92	62	74.9	3.13
Milledgeville	94	56	74.3	3.17
Idaho.				
Boisé Barracks	98	28	64.4	0.25
Sherman, Fort	92	31	54.3	1.30
Lewiston	103	36		1.08
Illinois.				
Charleston*	92	47	68.4	3.51
Geneseo	90	42	63.7	1.80
Mattoon	91	50	66.0	4.72
Pekin *	92	47	69.6	1.56
Peoria *	93	48	71.1	1.24
Riley	86	40	62.9	0.95
Rockford	87	48	64.3	1.98
Sandwich	90	51	68.6	1.88
South Evanston	85	37		2.12
Sycamore	91	43	63.5	0.95
Windsor	92	47	69.9	4.25
Indiana.				
Butlerville *	93	59	73.4	5.39
Jeffersonville	87	53	70.2	2.14
Logansport*	91	50	69.0	3.90
Lafayette	90	42	65.5	2.11
Manxy	86	42	65.6	3.68
Indiana—Cont'd.				
Sunman*	90	52	69.8	3.65
Vevay	90	48	68.6	3.99
Indian Territory.				
Gibson, Fort	93	49	70.9	2.54
Reno, Fort	95	38	70.0	3.99
Supply, Fort	92	35	69.2	2.37
Iowa.				
Bancroft	95	34	63.6	2.31
Cresco	92	40	59.0	0.88
Cedar Rapids *a*	88	40	66.3	1.20
Cedar Rapids *b*	90	35	64.5	0.25
Clinton	94	38	66.6	2.72
Des Moines	95	37	65.9	
Fort Madison	89	46		4.80
Independence *	84	44	67.0	1.06
Logan	90	34	66.7	1.30
Monticello *	91	40	65.1	2.72
Muscatine	89	41	65.0	2.26
Oskaloosa *a* *	94	45	68.2	0.18
Oskaloosa *b* *	94	48		
Kansas.				
Allison	98	39	66.7	1.16
Belleville	92			6.46
Elk Falls				2.88
Emporia	92	43	69.8	2.29
Globe	90	48	69.0	2.45
Hays, Fort	97	23	64.4	3.02
Independence	91	46	68.8	3.61
Lawrence	92	46	67.9	1.12
Manhattan *a*	96	40	68.5	2.55
Manhattan *b*	99	37	69.1	2.54
Marydale Farm *	98	35	69.2	1.58
Ninnescah	96	34	69.6	2.62
Riley, Fort	98	36	71.3	3.26
Salina *	79	41	71.3	3.01
Wellington	95	37	69.1	3.21
Wakefield	100	48	70.5	5.08
Wilson	97	30	67.4	1.32
Yates Centre	90	41	67.6	2.47
Kentucky.				
Bowling Green	89	55		
Frankfort	91	48	69.6	5.00
Harper's Ferry*	86	54	70.9	3.20
Midway	86	50	69.0	4.23
Louisiana.				
Grand Coteau	89	59	74.4	6.50
Liberty Hill	90			5.52
Maine.				
Bar Harbor	79	34		1.11
Cornish	84	42	58.6	2.13
Gardiner	88	35	55.7	1.08
Orono *	86	30	55.9	1.25
Maryland.				
Cumberland	91	50	65.9	5.64
Fallston	86	52	64.6	2.51
Great Falls	88	54	70.6	2.13
McDonogh	85	48	66.2	4.20
McHenry, Fort	80	50	70.8	5.62
New Midway *	90	55	70.9	0.12
Woodstock	89	42	65.0	4.05
Massachusetts.				
Amherst	86	33	60.9	1.13
Blue Hill Obs'y: Summit	87	42	57.7	2.54
Base	88	39		2.36
Deerfield	88	32	60.6	1.52
Dudley	87	40	61.4	0.99
Fall River	85	41	56.4	2.60
Heath	80	40		
Milton	86	40	55.5	2.39
New Bedford	80	39	57.5	2.15
North Truro				2.15
Somerset	89	38	62.0	3.13
Taunton	88	35	58.7	2.39
Westborough	91	34	62.9	1.27
Williamstown	82	35	63.0	1.31
Worcester	82	42	58.8	0.95
Michigan.				
Birmingham	96	39		1.95
Brady, Fort	88	33	57.7	1.07
East Saginaw	92	39	63.2	3.26
Harrisville *	90	30	56.3	3.17
Hudson *	91	39		2.84
Kalamazoo	84	45	66.0	4.01
Lansing	90	41	64.2	2.12
Mottville	88	42		2.62
Swartz Creek	93	37	63.0	1.71
Thornville *	93	44	64.6	4.30
Traverse City	97	34	57.0	0.74

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation.
Minnesota.	°	°	°	*Inches*
Minneapolis	88	40	63.7	2.59
Snelling, Fort	91	38	65.1	2.14
Missouri.				
Centreville	87	45		5.67
Fayette	92	49	69.6	4.55
Conception	89	43	67.3	4.00
Springfield *	87	45	65.2	4.60
Montana.				
Keogh, Fort	91	34	61.7	1.22
Missoula, Fort	85	39	55.8	0.46
Shaw, Fort	92	31	56.1	
Nebraska.				
Brownville *	98	39	69.0	4.93
Crete	94	34	64.7	5.68
De Soto *	97	33	66.4	1.39
Fairbury	90			3.90
Fremont *	92	35	62.4	2.87
Genoa	92	38	65.1	1.78
Hay Springs	86	28	56.5	5.87
Lincoln	94	37	65.2	3.79
Marquette *	94	36		1.61
Niobrara, Fort	94	32	64.6	1.82
Robinson, Fort	88	30	61.0	3.72
Sidney, Fort	88	28	59.7	1.05
Tecumseh *	96	30	68.1	5.79
Nevada.				
Carson City	101	22	58.7	0.46
McDermit, Fort	97	17	52.3	1.23
New Hampshire.				
Antrim				2.29
Ashland				2.39
Belmont				2.33
Berlin Mills	94	25		2.37
Bristol				2.84
Concord	94	36	60.0	2.35
Lake Village				2.02
Nashua	91	32	60.0	1.87
Wier's Bridge				1.99
Wolfborough				1.92
Woodstock				6.20
New Jersey.				
Beverly	87	52	65.2	1.50
Clayton	92	43	64.8	1.55
Dover	90	35	61.7	2.93
Egg Harbor City	90	40	61.7	1.04
Moorestown	86	43	63.9	1.88
Readington	88	50	67.5	
Roseland	86	36		1.69
Salem	90	53	68.3	
South Orange	86	50	63.0	0.93
New Mexico.				
Bayard, Fort	92	36	65.8	0.75
Gallinas Spring	82	37		3.60
Selden, Fort	101	34	71.3	0.58
Union, Fort	84	31	58.4	2.72
Wingate, Fort	83	28	57.0	0.22
New York.				
Auburn	84	34	63.2	1.56
Brooklyn *a*	87	48	64.4	0.95
Brooklyn *b*	86	43	62.5	0.74
Columbus, Fort	86	45	62.1	0.08
Cooperstown *	88	45	60.7	2.83
Factoryville*	92	40	65.8	1.33
Humphrey	88	43	61.2	1.50
Ithaca	88	40	63.4	3.07
Madison Barracks	84	37	60.5	1.56
Menands	84	51	64.7	1.92
Niagara, Fort	86	36	56.6	0.96
North Volney *	89	45	61.8	
Palermo *	89	41	60.2	1.85
Palmyra *	93	48		
Penn Yan				1.34
Plattsburg Barracks	86	38	60.9	0.40
Setauket	84	41	60.1	0.10
Utica	88	37	62.9	
West Point	90	37	64.5	1.50
White Plains	85	49	63.7	0.15
North Carolina.				
Chapel Hill	93	45	70.7	6.59
Flat Rock	81	48	63.9	5.49
Lenoir	85	51		4.00
Lincolnton	79	54	68.4	3.48
Raleigh	90	55	73.3	3.15
Reidsville	96	44	66.9	3.31
Statesville*	88	51	68.9	3.38
Wake Forest	90	43	70.7	2.58
Weldon *	91	52	70.6	8.07
Ohio.				
Cleveland	86	41	62.7	3.85
College Hill*	90	58	71.0	6.25
Garrettsville	90	36	61.5	3.47
Jacksonborough*	94	48	67.4	2.25
Lordstown	92	44	64.7	2.42
Ohio—Cont'd.				
Napoleon	90	46	66.3	2.73
North Lewisburg	91	48	67.8	4.35
Portsmouth	88	46	67.8	1.76
Ruggles *	88	47	60.8	2.55
Tiffin *a* *	92	50	63.4	2.21
Tiffin *b* *	94	52	66.6	2.52
Wauseon	92	40	63.2	3.50
Westerville	88	46	65.0	1.74
Yellow Springs	86	46	65.8	3.30
Oregon.				
Albany*	98	42	58.7	2.91
Bandon*	85	44	53.0	5.11
East Portland*	96	30		1.00
Eola *	96	32	55.8	3.37
Klamath, Fort	94	12	51.7	0.83
La Grande	90	30		0.56
Mount Angel	96	38	56.0	4.42
Pennsylvania.				
Altoona	93	46	68.7	3.14
Bethlehem	89	48	67.9	2.79
Blooming Grove*	91	49	65.2	5.20
Drifton	87	36	61.8	2.84
Dyberry	89	33	61.3	2.62
Easton				3.96
Fallsington *	84	51	63.4	3.61
Franklin*	86	44	61.3	3.04
Germantown	85	52		2.05
Grampian Hills *	90	50	65.1	3.38
Phillipsburg *	85	51	65.5	3.00
Quakertown*	83	42	62.0	2.99
State College	88	41	64.9	2.11
Wellsborough *	90	40	63.1	3.70
West Chester	84	45	64.4	4.06
Wysox	86	47	65.0	2.49
South Carolina.				
Aiken	89	55	74.4	3.84
Kirkwood*	83	56	70.3	2.14
Spartanburg *	95	47	70.9	1.72
Statesburg *	86	52	70.9	3.63
Tennessee.				
Ashwood	87	54	70.5	2.60
Austin *	90	56	79.2	3.32
Milan	91	55	71.4	2.65
Texas.				
Austin *	100	51	76.0	6.12
Cleburne	92	50	74.0	5.30
Comfort*	99	36		2.30
Concho, Fort	101	43	74.6	2.86
McIntosh, Fort	104	55	81.8	3.02
New Ulm	95	51	75.1	3.56
Ringgold, Fort	112	54	81.4	4.93
Silver Falls	98	37		4.25
Vermont.				
Burlington	84	36	64.9	2.00
Charlotte *	89	40	65.0	1.80
Lunenburg	82	38	59.4	2.23
Newport	85	40	61.6	1.40
Strafford *	84	36	63.0	2 20
Virginia.				
Bird's Nest*	89	54	68.8	2.80
Bruington	88	58		3.45
Dale Enterprise*	94	51	72.0	6.54
Marion	91	50	66.0	1.37
Monroe, Fort	89	50	67.8	2.30
Rappahannock	97	40	72.1	8.51
Summit	88	41	67.5	
University of Va.	91	44	71.0	6.03
Variety Mills	90	42	66.4	5.34
Wytheville	84	46	65.3	3.68
Washington Territory.				
Blakely *	88	34	56.2	3.42
Kenewick	102	32		0.35
Tacoma	78	39	53.9	3.42
Townsend, Fort	77	34	45.4	1.66
Spokane, Fort	99	29	58.4	0.30
Walla Walla, Fort	100	36	59.7	0.68
West Virginia.				
Clarksburg	88	38	70.8	1.38
Helvetia*	91	43	63.2	3.65
Middlebrook	83	43	60.6	
Parkersburg	88	44	66.9	3.05
Wisconsin.				
Delavan	90	38	64.0	3.11
Embarras	86	42	65.2	2.50
Fond du Lac	89	31	63.0	1.79
Madison	85	42	63.8	2.10
Manitowoc	80	36	59.1	1.04
Prairie du Chien	93	44	66.2	2.10
Wyoming.				
Camp Sheridan	89	22	47.0	
Laramie, Fort	91	23	63.0	1.50
McKinney, Fort	85	30	54.1	0.05
Washakie, Fort	90	26	56.4	0.41

Table of miscellaneous meteorological data for May, 1887—Signal Service observations.

Stations and districts.	Elevation above sea-level, feet.	Atmospheric pressure (in inches and hundredths). Mean actual barometer.	Mean reduced barometer.	Departure from normal.	Extremes. Highest barometer	Date.	Lowest barometer	Date.	Monthly range of barometer.	Temperature of the air (in degrees Fahrenheit). Monthly mean.	Departure from normal.	Extremes. Max.	Date.	Mean max	Min.	Date.	Mean min.	Monthly range.	Daily ranges. Greatest.	Date.	Least.	Date.	Mean relative humidity, per cent.	Mean temperature of the dew-point (degrees Fahrenheit).	Precipitation (in inches).	Departure from normal precipitation (in inches).	Winds. Total movement, miles.	Prevailing direction.	Maximum velocity. Miles p. h.	Direction.	Date.	No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
New England.										57.0	+ 2.7														1.40	− 2.26									
Eastport	53	29.99	30.05	+.08	30.44	3	29.58	26	0.86	48.1	+ 1.1	74.0	10	55.3	36.5	14	41.0	37.5	34.1	10	3.6	27	80.7	42.0	2.57	− 1.89	6,208	s.	28	nw.	11	10	16	13	12
Portland	99	29.94	30.04	+.08	30.39	2	29.58	26	0.81	55.7	+ 0.7	86.8	10	63.9	41.0	3	47.5	45.8	41.5	10	2.7	29	68.0	43.4	1.93	− 1.29	5,558	s.	28	nw.	11	10	7	10	14
Manchester	...	29.79	...	...	...	...	...	...	...	61.1	+ 4.1	88.9	10	72.4	35.2	13	47.8	53.7	46.9	10	6.2	29	59.9	44.5	2.20	...	3,773	s.	24	nw.	11	6	6	13	12
Mount Washington	6,279	23.88	30.05	+.08	30.48	2	29.63	27	0.85	42.2	+ 7.2	62.0	17	49.0	15.5	12	35.6	46.5	22.8	15	6.3	25	77.5	34.9	4.23	− 2.07	b	nw.	99	nw.	11	14	5	14	12
Northfield	871	29.10	30.02	+.06	30.33	14	29.54	26	0.79	58.9	+ 3.9	84.1	23	71.2	29.0	13	45.2	55.1	44.1	16	5.2	7	71.3	48.1	1.39	...	6,161	s.	30	n.	12	8	6	6	19
Boston	124	29.93	30.06	+.08	30.38	31	29.56	26	0.82	59.3	+ 4.3	89.3	20	67.6	44.7	14	51.8	44.6	38.9	10	3.0	29	67.6	46.4	1.67	− 1.83	7,458	e.	30	nw.	12	7	7	8	16
Edgartown	...	...	...	...	...	...	...	...	...	55.6	...	79.5	2	63.1	39.3	10	48.2	40.2	27.8	20	0.5	30	...	...	2.14	...	...	sw.	...	...	...	8	...	...	...
Nantucket	14	30.06	30.06	...	30.37	2	29.56	26	0.80	55.0	...	76.8	20	61.7	42.1	3	48.2	34.7	24.2	20	4.1	29	76.8	47.1	1.75	...	5,927	ne.	22	ne.	13	7	4	13	14
Wood's Holl	22	30.08	30.09	+.12	30.41	3	29.63	26	0.78	55.0	+ 1.0	75.1	20	64.2	41.6	10	49.0	33.5	24.4	17	4.8	7	80.7	48.8	1.91	− 0.87	6,862	sw.	28	sw.	23	6	7	9	15
Vineyard Haven	...	...	...	...	...	...	...	...	...	57.2	...	85.0	20	66.2	34.2	10	48.3	50.8	29.6	9	6.7	30	...	...	1.72	...	...	s.	...	...	...	3	...	...	...
Block Island	27	30.04	30.06	+.09	30.35	3	29.66	26	0.75	55.8	+ 3.8	77.4	20	62.3	43.8	14	50.1	33.6	20.4	20	5.7	7	81.6	49.9	0.51	− 4.25	7,271	sw.	28	sw.	24	3	6	11	14
Narragansett Pier	...	...	...	...	...	...	...	...	...	57.6	...	81.0	11	66.5	40.0	15	48.6	41.0	...	...	...	...	...	...	1.05	− 2.39	...	sw.	...	...	...	9	...	...	...
New Haven	107	29.95	30.05	+.08	30.34	2	29.56	26	0.78	60.5	+ 3.5	85.6	20	70.5	41.7	14	51.2	43.9	32.7	20	7.6	7	68.2	48.1	0.18	− 3.36	4,382	s.	20	ne.	12	4	7	8	16
New London	47	30.01	30.05	+.06	30.34	3	29.57	26	0.77	58.3	+ 2.3	82.2	11	67.2	44.4	14	50.6	37.8	29.4	19	4.0	7	76.2	50.0	1.36	− 2.19	2,829	se.	21	se.	31	6	6	17	8
Mid. Atlantic States.										65.4	+ 3.2														2.21	− 0.98									
Albany	85	29.96	30.04	+.06	30.35	14	29.53	26	0.82	65.4	+ 5.4	87.2	20	76.3	41.7	14	54.1	45.5	34.3	20	7.4	28	73.6	56.2	2.27	− 0.64	3,665	s.	23	se.	6	8	5	11	15
New York City	158	29.89	30.05	+.06	30.32	14	29.56	26	0.76	62.9	+ 3.9	87.5	11	73.6	47.2	1	55.2	40.3	30.5	11	7.2	7	63.8	49.0	0.99	− 2.06	3,865	se.	16	s.	26	5	5	11	15
Philadelphia	117	29.94	30.05	+.07	30.33	14	29.60	26	0.73	66.7	+ 4.7	87.9	11	78.3	48.7	14	57.9	39.2	29.1	11	9.4	8	63.3	51.9	0.62	− 2.38	5,101	e.	30	e.	31	8	6	14	11
Atlantic City	13	30.06	30.06	+.08	30.33	14	29.62	26	0.71	59.1	+ 2.1	73.3	30	66.2	46.7	1	53.9	26.6	18.7	15	5.3	9	84.8	54.1	1.61	− 0.92	5,188	s.	36	e.	31	8	3	11	17
Cape Henlopen	...	...	...	...	...	...	...	...	...	60.4	...	82.4	12	66.9	45.5	1	53.8	36.9	26.2	6	2.8	2	...	...	1.06	...	...	sw.	...	...	...	9	...	...	...
Baltimore	45	29.99	30.02	+.03	30.31	15	29.60	26	0.71	67.4	+ 3.4	86.7	12	76.6	51.2	14	58.9	35.5	24.4	3	5.4	8	67.1	54.8	2.57	− 0.64	3,783	se.	20	e.	31	9	6	14	11
Ocean City	...	...	...	...	...	...	...	...	...	59.8	...	71.5	12	65.1	45.8	1	54.5	25.7	17.5	1	4.1	14	...	...	1.77	− 1.11	...	s.	...	...	...	10	...	...	...
Washington City	106	29.93	30.03	+.04	30.33	14	29.63	26	0.70	67.9	+ 3.9	88.7	4	78.2	50.2	15	58.0	38.5	31.6	16	6.5	10	69.3	56.0	2.50	− 0.96	3,131	s.	24	nw.	25	10	8	13	10
Cape Henry	16	...	...	...	...	...	...	...	...	65.3	...	84.0	4	71.7	53.4	15	58.9	30.6	23.2	3	7.6	31	...	...	3.13	− 0.50	...	se.	...	...	...	8	...	...	...
Chincoteague	8	30.04	30.02	+.04	30.24	15	29.62	26	0.71	62.8	+ 2.8	81.2	4	70.1	47.4	1	55.8	33.8	26.8	4	6.4	24	83.6	57.3	3.34	+ 0.02	6,320	se.	29	w.	26	9	4	13	14
Lynchburg	652	29.34	30.01	+.02	30.34	15	29.63	26	0.71	68.9	+ 1.9	94.1	3	79.9	47.0	15	57.8	47.1	37.1	2	7.6	10	71.1	57.5	3.59	+ 0.29	2,177	e.	17	nw.	25	11	10	11	10
Norfolk	30	30.01	30.02	+.03	30.34	14	29.66	27	0.68	67.9	+ 0.9	92.0	4	77.6	49.5	1	59.8	42.5	32.6	18	4.5	7	73.0	58.0	1.94	− 1.92	4,106	ne.	19	s.	31	8	7	13	11
South Atlantic States.										71.9	+ 0.6														3.86	+ 0.07									
Charlotte	808	29.18	30.00	+.01	30.36	15	29.68	26	0.68	70.6	+ 1.6	90.9	18	81.2	50.4	15	61.4	40.5	30.3	2	8.1	31	73.0	60.6	3.64	− 0.65	2,935	e.	18	se.	30	16	8	17	6
Hatteras	11	30.05	30.04	+.04	30.26	3	29.53	27	0.73	69.1	+ 3.1	78.2	13	74.1	55.3	18	64.1	22.9	20.1	18	6.2	16	77.7	61.4	2.58	− 1.48	8,243	s.	43	w.	27	10	5	10	16
Kitty Hawk	9	...	...	...	...	...	...	...	...	68.7	...	89.0	25	76.6	51.0	18	60.8	38.0	31.5	18	4.5	16	...	...	2.82	− 0.78	...	se.	...	...	...	8	...	...	...
Raleigh	439	29.58	30.04	...	30.37	15	29.72	26	0.65	70.1	...	90.0	18	80.8	46.4	15	60.4	43.6	31.2	2	4.3	31	70.5	58.7	3.46	...	3,853	sw.	18	s.	25	11	7	19	5
Southport	...	...	...	...	...	...	...	...	...	72.0	...	84.0	20	78.9	47.0	15	65.2	37.0	23.0	15	7.1	22	...	...	4.93	+ 2.02	...	sw.	...	...	...	11	...	...	...
Wash Woods	...	...	...	...	...	...	...	...	...	67.0	...	86.0	5	74.7	50.0	15	59.3	36.0	23.0	3	7.0	2	...	...	3.26	− 0.75	...	se.	...	...	...	9	...	...	...
Wilmington	52	29.96	30.00	.00	30.31	3	29.68	26	0.63	71.1	+ 1.1	87.5	15	79.8	47.0	15	61.6	40.5	28.5	17	7.4	23	74.3	61.6	5.62	+ 1.40	4,402	sw.	20	e	22	14	6	14	11
Charleston a	52	29.98	30.00	+.01	30.31	3	29.72	27	0.59	72.7	− 0.3	88.8	25	80.4	55.1	15	66.4	33.7	22.7	18	7.8	22	75.1	63.8	4.26	+ 0.11	6,099	sw.	35	ne.	22	15	3	20	7
Augusta	183	29.84	29.99	−.02	30.31	15	29.71	27	0.60	73.7	+ 1.7	93.9	18	87.0	45.9	1	62.6	48.0	44.6	1	8.7	30	69.6	61.8	1.61	− 1.89	2,676	se.	23	e.	31	10	10	15	6
Savannah	87	29.84	30.00	.00	30.30	3	29.75	27	0.55	72.5	− 1.5	89.0	25	82.0	50.0	16	65.1	33.0	23.7	18	5.1	22	73.0	62.4	2.73	− 0.32	5,249	s.	23	e.	14	11	4	19	8
Jacksonville	43	29.98	29.99	.00	30.26	3	29.76	27	0.50	73.6	− 1.4	91.3	10	83.0	55.3	16	65.2	36.0	27.8	17	5.2	22	73.6	63.6	7.15	+ 3.05	5,424	s.	28	s.	6	14	5	15	11
Florida Peninsula.										75.4	− 1.6														3.38	+ 0.50									
Cedar Keys	21	29.99	29.97	−.01	30.23	3	29.77	30	0.46	74.9	− 1.1	86.7	14	81.4	57.0	16	67.5	29.7	25.1	16	6.9	27	75.6	66.3	4.43	+ 2.00	6,290	w.	26	s.	30	7	7	17	7
Key West	22	30.00	29.97	+.01	30.12	2	29.85	30	0.27	77.5	− 2.5	85.7	27	82.1	69.1	20	73.2	16.6	14.0	30	4.8	15	72.3	67.7	2.48	− 1.25	6,295	e.	32	s.	30	9	7	17	7
Sanford	25	29.98	29.97	+.01	30.21	2	29.78	27	0.43	73.9	− 1.1	90.7	25	83.8	54.3	1	65.1	36.4	27.5	1	6.5	21	74.7	64.6	3.22	+ 0.74	4,763	w.	27	ne.	14	11	2	21	8
Eastern Gulf States.										74.5	+ 1.5														3.15	− 1.27									
Atlanta	1,129	28.86	29.99	−.01	30.27	3	29.76	31	0.51	72.0	+ 3.0	88.7	17	82.3	57.1	28	61.9	31.6	27.8	1	11.6	30	64.7	58.3	1.76	− 1.82	6,008	se.	34	w.	25	11	8	19	4
Pensacola	30	29.97	29.96	−.01	30.16	2	29.73	30	0.43	75.5	+ 1.5	89.5	9	83.2	62.1	5	69.1	27.4	21.3	24	5.9	3	75.8	67.0	1.84	− 2.02	5,851	sw.	22	w.	27	11	5	16	10
Mobile	35	29.97	29.97	−.01	30.17	3	29.75	31	0.42	73.9	− 0.1	91.7	9	84.5	56.4	5	65.9	35.3	26.2	9	10.0	2	74.5	64.4	3.06	− 1.56	5,593	sw.	32	sw.	4	11	7	18	6
Montgomery	219	29.76	29.96	−.03	30.20	15	29.75	31	0.45	75.7	+ 2.7	92.1	11	86.6	60.0	1	60.5	32.1	31.1	1	12.4	26	69.2	63.8	2.84	− 1.19	3,403	se.	40	nw.	24	12	9	15	7
Vicksburg	222	29.76	29.96	−.01	30.15	16	29.73	31	0.42	74.9	+ 1.9	90.6	1	84.7	58.1	5	65.5	32.5	25.3	20	10.6	27	71.0	64.4	5.40	+ 0.37	3,532	sw.	24	nw.	29	11	6	12	13
New Orleans	52	29.95	29.97	+.01	30.12	9	29.77	31	0.35	75.2	+ 0.2	90.9	10	84.9	62.1	5	67.7	28.8	21.7	9	12.3	29	74.5	65.4	3.99	− 1.39	5,186	sw.	24	se.	3	9	3	18	10
Western Gulf States.										73.6	+ 0.5														5.32	+ 0.60									
Shreveport	227	29.74	29.94	.00	30.12	11	29.65	1	0.47	75.4	+ 1.4	98.9	26	88.3	52.9	5	65.6	46.0	32.4	6	7.2	4	74.1	65.6	5.15	+ 0.37	3,850	s.	25	s.	1	8	3	14	14
Fort Smith	500	29.48	29.96	+.02	30.24	3	29.59	1	0.65	70.5	+ 0.5	91.8	26	81.8	50.0	15	59.3	41.8	35.0	15	4.0	3	72.8	59.8	6.51	+ 3.43	2,853	e.	18	nw.	24	14	8	13	10
Little Rock	309	29.65	29.94	.00	30.20	3	29.64	1	0.56	71.4	+ 1.4	89.0	10	82.0	52.0	5	62.4	37.0	28.2	6	6.0	3	77.8	63.3	6.08	+ 0.40	3,522	s.	28	nw.	22	15	5	15	11
Corpus Christi	18	29.94	29.92	+.02	30.13	3	29.61	1	0.52	75.8	− 1.2	95.7	31	81.2	57.0	4	70.4	38.7	27.9	5	3.5	22	81.7	69.5	1.26	...	11,193	se.	37	se.	14	6	3	13	15
Galveston	40	29.96	29.96	+.03	30.10	9	29.73	1	0.37	75.9	− 0.1	86.7	30	81.4	56.9	4	70.7	29.8	19.9	4	6.2	2	78.0	68.1	4.84	+ 0.54	7,278	s.	28	s.	29	5	3	18	10
Palestine	533	29.44	29.96	.00	30.11	16	29.67	1	0.44	72.1	+ 1.1	91.9	26	83.5	46.5	4	62.8	45.4	28.7	5	7.6	3	73.4	62.2	6.76	− 0.05	6,134	s.	31	ne.	2	11	8	12	11
San Antonio	781	29.14	29.91	+.02	30.11	3	29.56	1	0.55	74.3	+ 0.3	97.0	1	86.8	47.0	4	63.6	50.0	38.2	4	11.7	15	69.7	61.9	2.61	− 1.09	7,031	se.	34	ne.	2	11	8	15	8
Rio Grande Valley.										78.1	− 0.9														4.02	+ 0.40									
Brownsville	57	29.89	29.90	+.03	30.10	4	29.71	27	0.39	76.1	− 1.9	91.4	30	86.7	56.2	4	68.8	35.2	27.9	5	10.2	28	84.3	70.7	3.94	+ 0.22	6,695	se.	32	n.	14	7	4	17	10
Rio Grande City	230	29.73	29.92	+.03	30.19	4	29.59	1	0.60	80.1	+ 0.1	108.3	1	92.7	57.3	4	69.9	51.0	40.7	5	15.3	28	64.6	65.2	4.09	+ 0.70	6,447	se.	38	n.	29	6	1	15	15
Ohio Val. & Tenn.										69.8	+ 3.9														3.83	− 0.10									
Chattanooga	783	29.21	29.99	−.01	30.25	15	29.72	31	0.53	70.7	+ 2.7	90.0	17	82.4	52.8	1	60.6	37.2	35.4	1	12.3	31	66.7	57.2	6.57	+ 2.56	3,237	ne.	33	s.	22	15	7	20	4
Knoxville	980	29.00	30.00	−.02	30.27	3	29.76	30	0.51	70.2	+ 4.2	87.9	17	81.5	52.3	1	59.1	35.6	35.5	1	10.8	6	73.8	60.3	4.79	+ 1.19	2,993	sw.	23	sw.	26	13	4	16	11
Memphis	320	29.64	29.95	−.01	30.18	3	29.66	31	0.52	73.2	+ 3.2	90.5	1	83.7	54.0	5	64.2	36.5	32.9	7	10.8	5	70.8	62.2	2.83	− 1.75	3,779	nw.	36	nw.	31	14	3	15	13
Nashville	549	29.40	29.96	−.02	30.19	15	29.67	31	0.52	70.7	+ 2.7	88.6	9	81.9	50.2	11	59.3	38.4	32.8	11	13.8	2	70.4	59.3	3.43	− 0.12	3,516	w.	27	w.	13	11	5	16	10
Louisville	551	29.41	29.97	+.01	30.22	3	29.67	31	0.56	70.9	+ 3.9	90.3	22	80.6	53.9	27	60.5	36.4	29.2	1	10.1	30	63.2	56.5	2.12	− 1.83	4,134	n.	24	sw.	23	14	7	16	8
Indianapolis	766	29.18	29.98	+.02	30.25	3	29.64	31	0.61	67.3	+ 3.3	89.0	22	77.8	49.0	27	56.2	40.0	32.0	19	11.0	5	67.4	54.8	2.39	− 1.84	3,252	ne.	19	nw.	26	12	7	10	14
Cincinnati	628	29.33	29.98	.00	30.23	15	29.69	24	0.54	69.3	+ 4.3	88.8	22	77.9	52.8	27	60.0	36.0	31.6	1	5.7	5	67.3	57.0	3.62	+ 0.04	3,925	ne.	24	nw.	23	14	5	19	7
Columbus	812	29.14	29.98	.00	30.25	15	29.67	24	0.58	67.4	+ 5.4	89.6	22	77.7	49.5	27	57.6	40.1	27.8	15	8.1	31	64.8	54.0	2.97	− 2.10	4,341	ne.	32	s.	5	12	6	14	11
Pittsburg	847	29.10	29.96	.00	30.24	15	29.63	26	0.61	68.2	+ 5.2	95.1	3	79.3	47.4	1	57.7	47.7	30.1	2	8.2	31	66.5	55.4	5.78	+ 2.95	3,904	ne.	24	s.	23	15	10	11	10
Lower lake region										61.8	+ 4.7														2.11	− 1.12									
Buffalo	690	29.29	30.03	+.06	30.37	14	29.64	24	0.73	61.6	+ 8.6	84.0	2	72.0	36.6	1	52.3	47.4	35.6	2	4.8	27	65.6	48.5	3.08	− 0.07	5,230	sw.	26	s.	2	10	5	14	12
Oswego	335	29.66	30.02	+.05	30.38	14	29.63	26	0.75	59.3	+ 5.3	86.9	22	68.5	42.8	4	49.9	44.1	32.9	22	7.9	28	69.6	48.8	1.03	− 1.74	5,643	se.	24	se.	31	4	6	14	11
Rochester	621	29.37	30.03	+.07	30.39	14	29.62	26	0.77	62.6	+ 6.6	86.1	23	72.2	39.7	1	52.6	46.4	35.0	2	11.6	28	66.7	50.5	1.17	− 1.97	6,085	sw.	27	se.	31	7	9	14	8
Erie	681	29.29	30.01	+.04	30.32	14	29.66	24	0.66	61.1	+ 4.1	86.0	2	69.7	43.2	6	51.6	42.8	30.0	2	8.8	27	67.9	49.5	2.96	− 0.54	5,699	ne.	30	s.	31	14	7	11	13
Cleveland	690	29.27	30.00	+.03	30.27	15	29.66	24	0.61	61.5	+ 3.5	85.0	2	70.8	41.2	1	52.4	43.8	30.1	2	8.9	8	69.9	50.7	3.45	+ 0.30	5,103	ne.	27	s.	30	12	8	9	14
Sandusky	638	29.34	30.01	+.04	30.30	15	29.65	24	0.65	61.1	+ 1.1	91.0	2	70.1	47.0	6	54.3	44.0	38.9	2	5.4	14	74.4	52.4	1.61	− 1.55	7,147	e.	31	nw.	26	10	7	10	14
Toledo	651	29.32	30.02	+.06	30.30	15	29.66	24	0.64	63.7	+ 3.7	90.9	21	73.1	46.4	26	55.2	44.5	29.2	20	7.5	5	65.4	50.7	1.46	− 1.94	4,609	ne.	29	ne.	5	12	5	12	14
Detroit	662	29.31	30.00	+.04	30.31	14	29.58	30	0.73	63.4	+ 4.4	87.0	21	72.1	44.9	18	53.7	42.1	29.8	15	6.3	15	65.4	50.5	2.11	− 1.44	4,962	e.	35	sw.	2	10	6	11	14
Upper lake region.										56.8	+ 4.6														2.13	− 1.21									
Alpena	609	29.35	30.00	+.04	30.32	11	29.57	24	0.75	54.1	+ 5.1	82.8	20	65.7	35.0	4	45.6	47.8	37.5	20	8.0	31	75.5	46.0	2.63	− 1.03	4,941	se.	34	sw.	3	10	7	11	13
Escanaba	608	29.32	29.98	+.03	30.29	15	29.48	2	0.81	54.4	+ 4.4	77.2	10	63.6	32.2	4	45.9	45.0	30.4	10	10.0	30	76.5	46.6	0.73	− 3.02	5,198	s.	29	sw.	2	6	5	10	16
Grand Haven	630	29.31	29.97	+.01	30.29	15	29.60	30	0.69	59.5	+ 4.5	84.0	11	69.6	42.1	3	51.3	41.9	28.9	29	6.9	25	66.5	47.5	2.91	− 0.42	6,385	nw.	39	s.	2	10	5	13	13
Lansing	870	29.09	30.00	+.04	30.29	15	29.60	24	0.69	66.7	+ 9.7	90.0	21	75.5	45.0	4	54.5	45.0	31.0	19	9.0	30	72.2	56.9	1.75	...	4,091	ne.	25	sw.	2	13	4	9	18
Mackinaw City	605	29.33	29.99	+.04	30.32	11	29.54	24	0.78	49.3	+ 0.3	82.7	2	62.2	31.6	4	41.2	51.1	47.9	2	7.7	25	76.9	41.4	1.49	− 0.93	6,262	se.	36	sw.	3	9	3	13	15
Marquette	672	29.23	29.96	−.01	30.30	16	29.33	2	0.97	56.8	+ 7.8	87.9	21	68.8	32.8	4	47.6	55.1	40.1	18	9.0	25	72.7	47.5	1.04	− 1.84	5,554	nw.	36	s.	2	7	4	11	16
Port Huron	639	29.32	30.01	+.05	30.33	14	29.59	24	0.74	57.1	+ 4.1	89.2	21	65.9	39.8	6	48.4	49.4	34.9	19	7.0	31	76.8	49.7	2.24	− 1.01	6,722	ne.	30	se.	30	10	4	14	13
Chicago	717	29.22	29.97	+.01	30.27	15	29.58	30	0.69	59.4	+ 2.4	85.7	20	68.8	42.3	6	51.1	43.4	32.9	1	7.2	5	67.9	47.9	1.38	− 2.26	6,915	ne.	44	sw.	2	9	8	8	15
Green Bay	616	29.30	29.97	+.02	30.30	15	29.53	2	0.77	62.0	+ 9.0	86.3	21	72.8	37.9	18	51.2	48.4	34.4	18	7.5	5	63.4	48.0	0.90	...	5,999	sw.	41	sw.	2	9	7	11	13
Milwaukee	697	29.23	29.98	+.02	30.29	15	29.58	1	0.71	56.9	+ 2.9	80.1	2	66.1	41.7	18	48.9	38.4	31.9	2	6.2	5	67.3	45.6	1.80	− 1.58	6,054	se.	48	sw.	2	8	9	8	14
Duluth	672	29.21	29.95	−.01	30.39	16	29.32	2	1.07	49.0	0.0	80.4	18	58.7	35.1	4	41.6	45.3	38.7	18	7.8	31	73.8	39.7	4.93	+ 1.19	4,426	ne.	28	nw.	24	9	3	10	18
Extreme northwest.										58.4	+ 4.8														2.25	− 0.44									
Moorhead	926	28.86	29.86	−.10	30.49	16	29.19	1	1.30	60.0	+ 6.0	95.5	10	75.4	25.1	17	45.2	70.4	48.3	5	11.9	30	62.9	45.2	2.57	− 0.47	10,553	n.	61	se.	7	10	10	11	10
Saint Vincent	804	29.01	29.90	−.09	30.58	16	29.31	2	1.27	57.7	+ 5.7	96.0	10	71.8	24.8	17	44.4	71.2	49.7	17	6.5	2	80.4	51.2	3.57	− 1.35	7,305	nw.	38	nw.	2	10	7	14	10
Bismarck	1,694	28.11	29.90	−.01	30.60	16	29.43	19	1.17	59.0	+ 4.0	90.6	25	74.6	25.7	2	46.5	64.9	43.1	25	13.1	16	66.4	46.3	2.19	− 0.72	7,201	nw.	40	n.	2	11	5	10	16
Fort Buford	1,854	27.87	29.84	−.03	30.57	16	29.29	7	1.28	58.3	+ 4.3	93.0	10	71.9	32.5	2	45.4	60.5	44.0	3	10.5	1	55.2	38.7	1.59	− 0.35	9,584	nw.	46	nw.	2	7	8	21	2
Fort Totten	1,487	28.28	29.90	−.04	30.59	16	29.43	19	1.16	57.0	+ 4.0	90.0	19	69.8	29.0	17	45.2	61.0	40.0	17	6.0	1	64.1	42.9	1.57	− 0.31	10,960	n.	52	s.	7	13	4	15	12
Fort Yates	...	...	...	...	...	...	...	...	...	60.0	...	92.8	19	73.2	31.4	17	46.8	61.4	45.0	9	15.0	13	...	...	2.00	+ 0.56	...	nw.	...	...	...	10	...	...	...

Table of miscellaneous meteorological data for May, 1887—Signal Service observations—Continued.

Stations and districts.	Elevation above sea-level, feet.	Atmospheric pressure (in inches and hundredths).								Temperature of the air (in degrees Fahrenheit).												Mean relative humidity, per cent.	Mean temperature of the dew-point (degrees Fahrenheit).	Precipitation (in inches).	Departure from normal precipitation (in inches).	Winds.				No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
		Mean actual barometer.	Mean reduced barometer.	Departure from normal.	Extremes.				Monthly range of barometer.	Monthly mean.	Departure from normal.	Extremes.				Monthly range.	Daily ranges.				Total movement, miles.	Prevailing direction.	Maximum velocity.							
					Highest barometer	Date.	Lowest barometer	Date.				Max.	Date.	Mean max	Min.	Date.	Mean min.		Greatest.	Date.	Least.	Date.					Miles p. h.	Direction.	Date.				
Upper Miss. Valley.										67.1	+ 4.9													2.20	— 1.95							
Saint Paul	831	29.02	29.91	—.02	30.34	16	29.16	2	1.18	64.1	+ 6.1	91.1	9	76.3	36.9	3	51.8	54.2	40.3	2	11.8	22	62.8	50.0	1.60	— 1.74	5,863	se.	36	s.	2	7	4	15	12
La Crosse	744	29.18	29.97	+.04	30.37	15	29.35	2	1.02	65.3	+ 5.3	91.3	9	77.1	40.4	18	53.8	50.9	36.1	18	8.1	30	62.0	50.7	0.50	— 2.68	5,870	s.	33	se.	1	5	9	13	9
Davenport	615	29.31	29.95	.00	30.27	3	29.47	1	0.80	67.1	+ 6.1	90.0	9	77.2	44.2	3	56.5	45.8	27.6	9	10.9	31	59.6	51.3	1.76	— 2.48	5,396	ne.	40	sw.	2	12	6	14	11
Des Moines	866	29.04	29.94	.00	30.32	15	29.28	1	1.04	65.7	+ 4.7	93.4	9	78.4	39.0	30	53.6	54.4	37.2	26	14.8	3	55.5	47.4	2.31	— 3.03	5,293	s.	27	w.	2	7	3	12	16
Dubuque	665	29.26	29.96	+.01	30.32	15	29.44	1	0.88	66.6	+ 7.6	90.0	9	77.4	41.3	3	55.0	49.6	32.2	28	10.6	5	64.5	53.3	2.53	— 1.39	3,541	se.	24	s.	2	12	4	11	16
Keokuk	618	29.31	29.95	+.01	30.27	3	29.45	1	0.82	66.5	+ 3.5	88.6	1	76.6	47.9	31	57.6	40.7	28.5	1	8.1	16	66.5	53.9	2.54	— 1.56	5,305	s.	50	se.	1	13	5	14	12
Cairo	359	29.60	29.96	—.01	30.24	3	29.68	31	0.56	70.1	+ 2.1	86.6	9	78.8	52.9	7	62.5	33.7	24.6	9	5.5	5	73.6	60.3	1.37	— 2.75	4,162	s.	41	s.	2	15	8	18	5
Springfield	644	29.31	29.98	+.01	30.29	3	29.60	1	0.69	67.2	+ 3.2	86.0	21	77.6	48.3	3	57.2	37.7	29.4	28	10.6	16	68.2	55.5	1.92	— 3.22	5,154	s.	28	s.	2	11	9	9	13
Saint Louis	571	29.37	29.95	.00	30.29	3	29.56	1	0.73	71.4	+ 5.4	89.0	22	78.8	51.1	4	63.4	37.9	22.8	22	5.0	5	62.3	56.9	5.27	+ 1.30	4,674	s.	28	sw.	22	15	9	12	10
Missouri Valley.										64.1	+ 4.3													1.95	— 2.35							
Lamar	1,028																																
Leavenworth	842	29.09	29.96	+.02	30.33	3	29.36	1	0.97	67.9	+ 2.9	89.6	10	79.8	45.0	3	59.1	44.6	29.2	25	5.7	4	65.3	54.4	3.07	— 2.01	4,823	n.	30	s.	1	12	6	15	10
Omaha	1,113	28.80	29.96	+.01	30.34	15	29.22	1	1.12	66.1	+ 3.1	93.0	1	78.2	39.2	3	55.4	53.8	32.1	7	11.2	14	57.1	48.4	1.39	— 3.56	7,384	s.	34	nw.	2	6	7	8	16
Valentine	2,614	27.24	29.90	—.04	30.48	16	29.30	1	1.18	61.1	+ 5.1	88.1	7	75.2	21.5	2	47.1	66.6	42.9	1	8.5	22	56.4	42.8	2.60	— 0.66	10,553	nw.	66	nw.	2	8	4	10	17
Huron	1,307	28.52	29.91	—.04	30.48	16	29.15	1	1.33	62.1	+ 7.1	91.9	9	76.8	32.3	3	47.6	59.6	45.6	9	12.5	2	57.1	43.9	1.39	— 2.34	10,080	se.	49	nw.	2	8	5	9	17
Yankton	1,234	28.59	29.89	—.04	30.40	17	29.15	1	1.25	63.5	+ 3.5	90.5	9	77.2	35.7	3	50.6	54.8	39.9	9	10.7	30	66.0	50.5	1.28	— 3.17	7,565	s.	40	nw.	2	5	6	9	16
Northern slope.										53.8	+ 2.8													1.65	— 0.23							
Fort Assinaboine	2,690	27.12	29.92	—.02	30.53	16	29.41	18	1.12	56.4	+ 3.4	91.9	30	70.2	28.6	16	41.3	63.3	48.7	9	11.3	13	41.0	30.5	0.72	— 0.51	9,378	nw.	48	w.	4	6	5	12	14
Fort Custer	3,040	26.81	29.93	+.01	30.56	16	29.24	6	1.32	57.6	+ 2.6	91.7	31	71.8	32.5	17	43.3	59.2	46.8	9	5.7	13	50.6	35.1	1.15	— 1.29	6,373	se.	38	w.	31	11	5	14	12
Fort Maginnis	4,320	25.55	29.92	.....	30.56	16	29.45	6	1.11	55.2	.....	88.3	30	66.3	26.4	16	40.7	61.9	48.1	9	7.9	13	41.4	27.8	0.51	— 0.17	10,383	nw.	48	nw.	11	6	5	13	13
Helena	4,069	25.81	29.93	—.01	30.48	16	29.40	9	1.08	51.5	— 0.5	88.1	30	64.6	30.7	1	39.8	57.4	43.6	9	7.9	11	72.6	41.9	2.41	+ 1.44	6,084	sw.	30	w.	24	9	6	13	12
Poplar River	2,002	27.78	29.88	—.06	30.63	16	29.36	10	1.27	57.2	.....	99.2	10	73.1	28.8	2	42.4	70.4	52.5	9	10.2	20	62.4	41.8	1.04	— 0.41	8,841	n.	46	n.	1	9	4	12	15
Deadwood	4,600	25.38	29.98	+.01	30.54	16	29.47	7	1.07	54.0	+ 4.0	80.2	10	64.7	30.9	1	44.6	49.3	36.8	9	5.1	13	67.8	42.5	4.25	— 0.45	4,501	sw.	24	sw.	19	10	5	14	12
Cheyenne	6,105	24.00	29.90	—.03	30.39	16	29.45	1	0.94	53.6	+ 3.6	84.0	31	68.9	23.8	3	39.8	60.2	40.5	31	14.0	16	49.4	31.2	0.94	— 1.20	8,240	nw.	39	se.	10	8	8	12	11
Fort Laramie	.....	.....	.....	.....	.....	.....	.....	.....	.....	58.8	.....	90.5	31	75.8	21.8	3	41.9	68.7	51.4	3	13.6	2	.....	.....	3.02	+ 2.86	.....	e.	.....	.....	...	7	...	...	...
North Platte	2,841	27.04	29.92	—.01	30.46	16	29.32	1	1.15	61.9	+ 3.9	92.7	7	77.0	30.6	3	48.9	62.1	42.1	5	11.6	13	61.9	46.1	0.81	— 2.35	8,345	se.	44	nw.	2	5	5	10	16
Middle slope.										64.1	+ 3.7													4.10	+ 0.12							
Denver	5,294	24.74	29.88	.00	30.36	16	29.32	1	1.04	59.5	+ 4.5	89.4	31	73.5	30.9	5	45.0	58.5	49.3	5	13.3	22	47.4	35.8	1.13	— 1.76	5,672	s.	28	s.	18	5	4	15	12
Pike's Peak	14,134	17.86	29.98	.....	30.52	3	29.38	1	1.14	26.5	.....	44.3	31	33.7	— 1.8	3	20.3	46.1	23.6	3	4.3	27	79.3	20.6	2.00	— 1.89	13,124	sw.	72	sw.	7	19	3	20	8
Las Animas	3,899	26.02	29.87	.00	30.36	3	29.29	1	1.06	63.0	+ 4.0	90.0	19	77.7	34.9	3	49.6	55.1	42.1	4	9.3	27	69.4	51.3	2.92	+ 0.57	6,078	w.	47	nw.	1	11	6	12	13
Concordia	1,384	28.51	29.94	+.01	30.34	17	29.22	1	1.12	66.2	+ 3.2	95.4	7	78.9	36.5	3	54.2	58.9	42.0	5	4.8	16	61.0	49.9	6.08	+ 2.44	6,586	s.	45	e.	21	7	6	9	16
Dodge City	2,523	27.37	29.96	+.03	30.39	3	29.36	1	1.03	65.4	+ 3.4	95.0	6	78.9	35.3	4	53.0	59.7	44.0	6	12.9	10	61.1	48.8	3.69	— 0.31	7,912	se.	48	s.	1	11	4	12	15
Fort Reno	.....	.....	.....	.....	.....	.....	.....	.....	.....	70.6	.....	99.0	6	82.0	38.8	3	58.0	60.2	.....	.....	.....	.....	.....	.....	4.13	— 0.73	.....	e.	.....	.....	...	11	...	...	...
Fort Supply	.....	.....	.....	.....	.....	.....	.....	.....	.....	71.6	.....	94.2	6	83.2	43.9	3	60.1	50.3	41.9	5	5.8	17	.....	.....	3.74	— 1.31	.....	se.	.....	.....	...	8	...	...	...
Fort Elliott	2,700	27.22	29.88	+.08	30.25	3	29.40	1	0.81	66.6	+ 3.6	92.0	6	79.3	39.1	4	53.6	52.9	42.9	5	11.3	8	63.4	51.7	7.01	+ 1.93	9,114	se.	40	n.	14	11	5	14	12
Southern slope.										71.0	+ 1.3													2.66	+ 0.79							
Fort Sill	1,200	28.72	29.94	+.03	30.26	3	29.52	1	0.74	71.2	+ 2.2	93.0	6	82.5	41.5	3	61.0	51.5	34.4	5	7.8	10	66.6	58.0	5.36	+ 0.82	7,718	s.	36	s.	7	12	3	17	11
Abilene	1,748	28.15	29.90	.00	30.20	3	29.53	1	0.67	72.7	+ 0.7	100.0	31	83.9	45.3	4	62.4	54.7	38.5	5	10.6	28	57.0	53.6	3.95	+ 3.62	8,645	s.	52	w.	9	9	6	18	7
Fort Davis	4,928	25.16	29.87	+.01	30.22	3	29.61	1	0.61	69.0	+ 1.0	91.3	26	82.4	43.0	3	56.7	48.3	36.5	5	19.0	28	32.5	32.5	0.61	— 0.82	5,622	sw.	30	sw.	26	5	1	14	16
Fort Stanton	6,150	23.98	29.82	—.06	30.23	3	29.40	1	0.83	55.8	.....	84.0	31	72.6	29.1	3	41.0	54.9	45.0	5	18.0	15	50.3	35.1	0.72	— 0.46	4,655	nw.	36	nw.	1	5	0	11	20
Southern plateau.										65.3	+ 0.8													0.46	+ 0.17							
El Paso	3,764	26.21	29.86	+.04	30.23	3	29.64	19	0.59	71.8	— 0.2	97.0	31	86.2	41.0	2	57.0	56.0	43.2	5	20.0	25	32.5	37.5	0.13	— 0.27	3,164	nw.	19	e.	16	3	0	4	27
Lava	.....	.....	.....	.....	.....	.....	.....	.....	.....	66.4	.....	97.1	31	86.0	35.1	2	46.9	62.0	.....	.....	.....	.....	.....	.....	0.40	— 0.01	.....	se.	.....	.....	...	3	...	...	...
Santa Fé	7,026	23.29	29.93	+.06	30.39	3	29.59	1	0.80	55.3	— 0.7	81.0	31	67.5	24.0	2	42.5	57.0	41.6	4	11.5	27	39.9	27.4	1.73	+ 0.89	1,569	sw.	10	n.	3	7	2	15	14
Fort Apache	5,020	25.02	29.92	+.02	30.29	3	29.67	18	0.62	61.6	+ 3.6	91.6	31	80.5	32.0	3	41.8	59.6	50.3	14	20.9	18	31.6	26.9	0.15	— 0.42	6,918	e.	30	sw.	18	3	2	13	16
Fort Bowie	.....	.....	.....	.....	.....	.....	.....	.....	.....	69.2	.....	90.5	31	80.9	42.5	1	57.6	48.0	.....	.....	.....	.....	.....	.....	trace	— 0.14	.....	sw.	.....	.....	...	9	...	...	...
Fort Grant	4,910	25.20	29.90	+.02	30.21	3	29.72	18	0.49	66.7	+ 0.7	89.1	31	77.8	42.3	2	56.0	46.8	30.6	4	13.8	26	24.4	27.0	0.16	— 0.21	5,733	n.	44	e.	17	3	6	8	17
Fort McDowell	.....	.....	.....	.....	.....	.....	.....	.....	.....	76.0	.....	107.0	31	97.0	45.0	14	55.0	62.0	.....	.....	.....	.....	.....	.....	trace	— 0.15	.....	w.	.....	.....	...	0	...	...	...
Fort Thomas	2,710	.....	.....	.....	.....	.....	.....	.....	.....	73.5	.....	100.1	18	93.4	39.3	2	53.6	60.8	.....	.....	.....	.....	.....	.....	2.73	+ 2.44	.....	sw.	.....	.....	...	2	...	...	...
Fort Verde	.....	.....	.....	.....	.....	.....	.....	.....	.....	66.7	.....	97.0	31	85.1	39.0	2	48.3	58.0	.....	.....	.....	.....	.....	.....	0.60	+ 0.28	.....	w.	.....	.....	...	3	...	...	...
Maricopa	.....	.....	.....	.....	.....	.....	.....	.....	.....	78.0	.....	108.2	30	95.0	48.1	14	61.2	60.1	49.9	5	19.4	12	.....	.....	0.31	+ 0.25	.....	sw.	.....	.....	...	3	...	...	...
Phœnix	.....	.....	.....	.....	.....	.....	.....	.....	.....	78.9	.....	110.2	30	99.6	48.1	1	58.2	62.1	.....	.....	.....	.....	.....	.....	0.06	— 0.07	.....	nw.	.....	.....	...	3	...	...	...
Prescott	5,389	24.71	29.90	+.02	30.30	3	29.65	18	0.65	59.3	+ 1.3	87.0	31	75.6	30.3	1	41.9	56.7	44.8	14	18.6	26	57.3	42.8	0.43	— 0.07	5,727	sw.	32	sw.	20	4	3	7	21
San Carlos	.....	.....	.....	.....	.....	.....	.....	.....	.....	72.6	.....	102.9	30	91.6	43.5	2	53.7	59.4	48.0	4	22.0	23	.....	.....	0.06	— 0.30	.....	se.	.....	.....	...	2	...	...	...
Willcox	.....	.....	.....	.....	.....	.....	.....	.....	.....	64.0	.....	95.0	31	85.9	28.0	2	42.3	67.0	.....	.....	.....	.....	.....	.....	0.48	+ 0.48	.....	sw.	.....	.....	...	1	...	...	...
Yuma	141	29.71	29.82	+.04	30.13	2	29.64	18	0.49	77.2	+ 0.2	103.5	31	92.1	44.5	2	59.5	59.0	43.3	6	18.5	1	59.1	60.7	trace	— 0.05	5,121	sw.	28	w.	7	0	0	4	27
Keeler	3,622	26.26	29.82	—.09	30.20	2	29.48	6	0.72	66.7	.....	93.3	29	78.2	37.0	1	54.2	56.3	32.0	1	16.8	10	34.1	35.8	0.04	+ 0.04	5,535	sw.	34	nw.	1	3	1	12	18
Middle plateau.										58.5	+ 2.5													0.89	— 0.42							
Fort Bidwell	4,615	25.38	30.00	+.05	30.36	2	29.64	19	0.72	53.8	.....	93.0	30	67.1	20.4	11	40.7	72.0	38.0	30	13.5	3	53.2	35.5	1.47	— 0.14	5,954	w.	36	sw.	9	9	6	17	8
Winnemucca	4,358	25.60	29.93	+.03	30.34	2	29.56	9	0.78	56.6	+ 2.6	95.9	30	72.5	16.8	12	39.4	79.1	44.2	3	20.4	10	36.0	25.0	0.36	— 0.47	6,919	sw.	44	w.	31	5	2	12	17
Frisco	6,406	23.70	29.81	—.09	30.25	2	29.44	6	0.81	56.2	.....	82.4	30	66.1	24.3	1	45.1	58.1	30.7	3	12.8	18	38.9	28.8	0.19	+ 0.19	9,132	n.	46	sw.	6	2	1	11	19
Salt Lake City	4,348	25.58	29.88	—.01	30.32	2	29.40	6	0.92	60.4	+ 2.4	93.3	31	73.0	30.7	1	48.5	62.6	36.3	16	8.8	12	53.9	42.3	0.73	— 1.28	4,926	nw.	29	s.	10	3	3	13	14
Montrose	5,780	24.27	29.83	—.06	30.35	3	29.47	19	0.88	58.7	.....	89.0	31	74.2	28.3	14	43.1	60.7	40.1	9	17.9	2	35.7	27.4	0.07	— 0.65	5,640	s.	36	e.	18	3	2	12	17
Fort Bridger	6,643	23.51	29.94	+.04	30.34	2	29.51	6	0.83	50.1	.....	81.0	31	63.4	26.2	2	35.4	54.8	40.5	9	10.3	1	56.7	34.6	0.71	— 0.20	7,092	w.	36	sw.	6	4	2	23	6
Northern plateau.										52.3	+ 2.9													0.91	— 0.40							
Boisé City	2,750	27.14	29.95	.00	30.33	2	29.49	18	0.84	60.4	+ 3.4	97.3	30	76.7	26.1	11	43.8	71.2	44.5	9	21.0	3	52.4	40.1	0.51	— 0.70	3,259	nw.	33	nw.	9	7	4	18	9
Fort Sherman	.....	.....	.....	.....	.....	.....	.....	.....	.....	53.8	.....	91.9	30	66.7	30.9	12	41.0	61.0	.....	.....	.....	.....	.....	.....	1.40	— 0.50	.....	se.	.....	.....	...	9	...	...	...
Ashland	.....	.....	.....	.....	.....	.....	.....	.....	.....	57.8	.....	101.0	29	72.9	27.0	12	42.8	74.0	46.0	28	10.0	9	.....	.....	1.15	— 0.75	.....	w.	.....	.....	...	14	...	...	...
Fort Klamath	.....	.....	.....	.....	.....	.....	.....	.....	.....	48.6	.....	89.0	29	64.3	14.0	11	32.9	75.0	.....	.....	.....	.....	.....	.....	0.85	— 0.29	.....	w.	.....	.....	...	7	...	...	...
Lakeview	.....	.....	.....	.....	.....	.....	.....	.....	.....	52.1	.....	92.5	30	65.6	20.0	1	38.6	72.5	36.5	30	13.0	7	.....	.....	1.05	— 0.17	.....	e.	.....	.....	...	6	...	...	...
Linkville	.....	.....	.....	.....	.....	.....	.....	.....	.....	55.1	.....	92.6	29	68.1	24.0	11	42.2	68.0	53.5	28	8.3	30	.....	.....	0.54	— 1.04	.....	nw.	.....	.....	...	8	...	...	...
Fort Spokane	.....	.....	.....	.....	.....	.....	.....	.....	.....	56.0	.....	94.7	29	72.6	29.5	11	39.3	65.2	47.8	17	11.8	3	.....	.....	0.55	— 0.39	.....	sw.	.....	.....	...	4	...	...	...
Spokane Falls	1,909	27.96	29.98	+.01	30.41	15	29.49	18	0.92	56.5	+ 0.5	94.9	30	69.0	30.0	12	41.7	64.9	43.4	17	8.1	6	61.2	42.0	1.06	— 0.13	3,433	sw.	19	sw.	5	8	4	10	17
Walla Walla	1,018	28.92	30.01	+.02	30.35	28	29.58	18	0.77	60.9	+ 4.9	98.7	30	72.8	37.0	1	48.8	61.7	40.9	29	13.3	5	46.5	37.3	1.08	+ 0.41	4,827	sw.	35	sw.	5	8	10	6	15
N. Pac. coast region.										53.9	— 0.3													5.04	+ 2.54							
Olympia	36	30.00	30.04	.00	30.37	28	29.56	7	0.81	55.0	+ 1.0	88.8	29	65.9	31.5	12	43.8	57.3	44.4	7	6.0	6	76.5	46.7	5.66	+ 3.13	3,489	s.	24	s.	7	11	12	10	9
Port Angeles	14	29.99	30.01	—.02	30.38	28	29.40	2	0.98	49.6	— 3.4	73.8	29	58.5	30.4	12	40.6	43.4	30.0	17	6.6	24	81.8	43.7	2.11	+ 1.15	4,166	s.	29	w.	30	12	11	8	12
Tatoosh Island	86	29.90	30.00	—.03	30.35	28	29.31	7	1.04	49.8	— 2.2	69.0	16	55.7	36.4	1	44.8	32.6	18.4	16	4.5	10	81.9	44.2	8.85	+ 4.40	10,522	sw.	48	e.	29	15	14	8	9
Astoria	.....	30.03	.....	.....	.....	.....	.....	.....	.....	53.4	.....	86.0	29	62.0	36.0	11	47.4	50.0	29.0	30	5.0	31	78.9	46.2	7.33	+ 4.52	5,854	sw.	24	sw.	4	12	15	10	6
Portland	80	29.96	30.05	+.01	30.36	11	29.67	7	0.69	57.9	+ 0.9	99.0	29	69.3	34.2	12	48.2	64.8	35.8	23	10.0	6	63.2	43.5	4.77	+ 2.33	5,282	nw.	27	s.	7	13	10	12	9
Roseburg	523	29.49	30.05	.00	30.43	1	29.76	7	0.67	57.2	+ 1.2	102.0	29	70.2	31.7	12	45.4	70.3	45.4	29	10.8	9	65.0	44.0	1.53	— 0.29	3,444	nw.	21	s.	9	13	8	15	8
Mid. Pac. coast reg.										59.4	— 0.6													0.03	— 0.59							
Eureka	.....	30.03	.....	.....	.....	.....	.....	.....	.....	51.9	.....	75.0	28	58.2	35.0	1	46.3	40.0	26.2	28	4.4	18	84.7	47.3	3.51	.....	5,449	n.	29	n.	27	9	15	12	4
Red Bluff	342	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sacramento	64	29.91	29.96	+.02	30.25	1	29.71	31	0.54	62.9	— 0.1	97.7	28	75.9	39.0	17	50.5	58.7	35.0	13	13.2	19	62.9	48.8	trace	— 0.62	6,422	sw.	29	nw.	27	0	1	9	21
San Francisco	60	29.98	30.02	+.03	30.30	1	29.80	28	0.50	55.8	— 1.2	96.9	28	64.5	45.6	11	49.6	51.3	39.4	28	6.9	19	75.4	47.4	0.06	— 0.56	8,233	w.	32	w.	28	3	8	13	10
S. Pac. coast region.										62.6	+ 0.6													0.34	— 0.09							
Los Angeles	339	29.62	29.95	+.02	30.14	2	29.84	27	0.30	63.0	+ 1.0	92.0	3	77.7	44.5	12	51.3	47.5	38.7	3	13.3	6	72.9	53.3	0.20	— 0.25	4,694	w.	30	nw.	1	3	5	11	14
San Deigo	66	29.92	29.90	+.02	30.14	2	29.85	28	0.29	62.1	+ 0.1	79.0	3	68.2	47.5	1	56.2	31.5	27.2	2	4.6	23	75.9	53.1	0.47	+ 0.07	5,026	w.	20	nw.	13	3	11	11	9

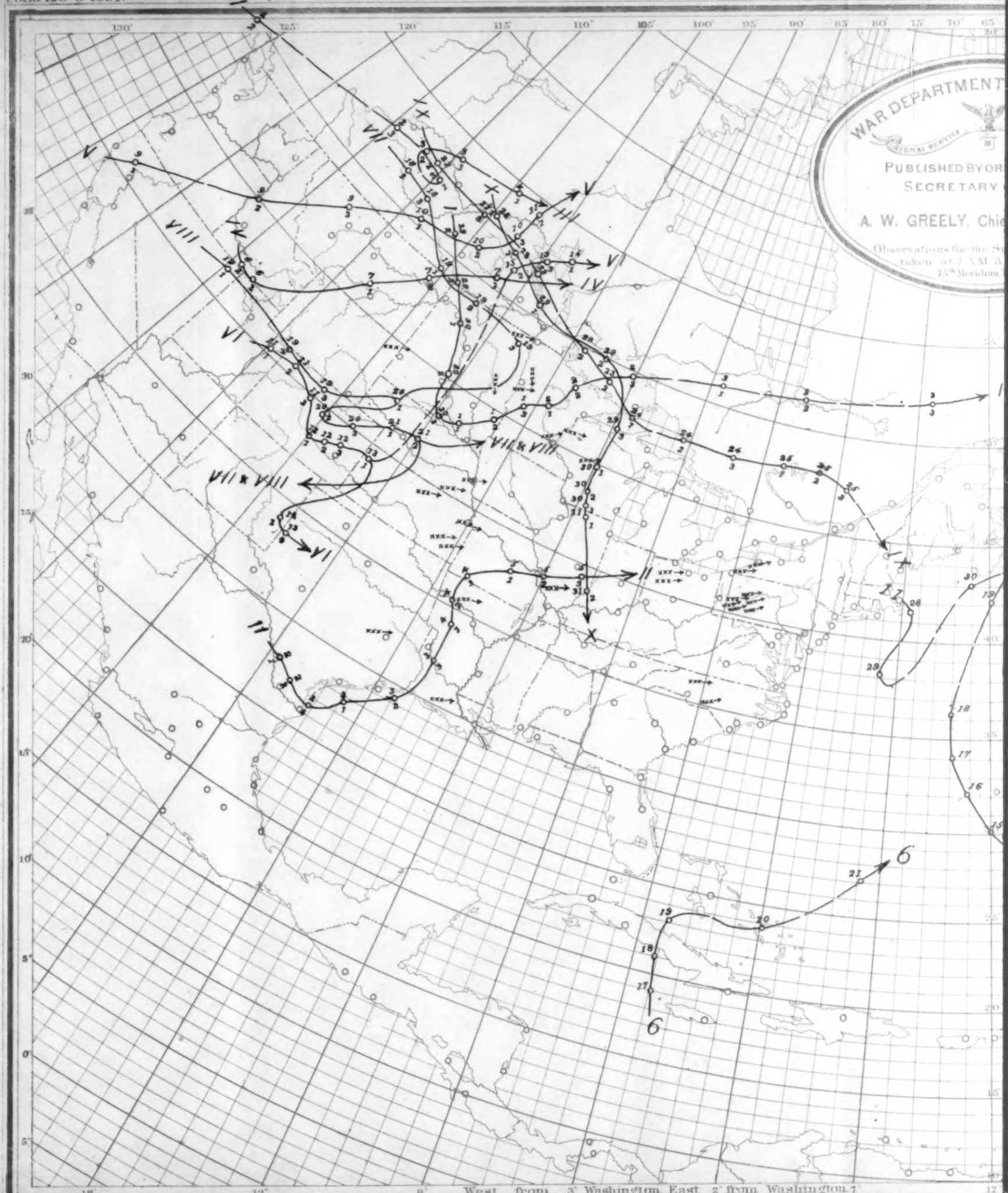
NOTE.—The data at Mount Washington, N. H., Pike's Peak, Colo., and stations having no departures are not used in computing the district averages.

a Record for 30 days.

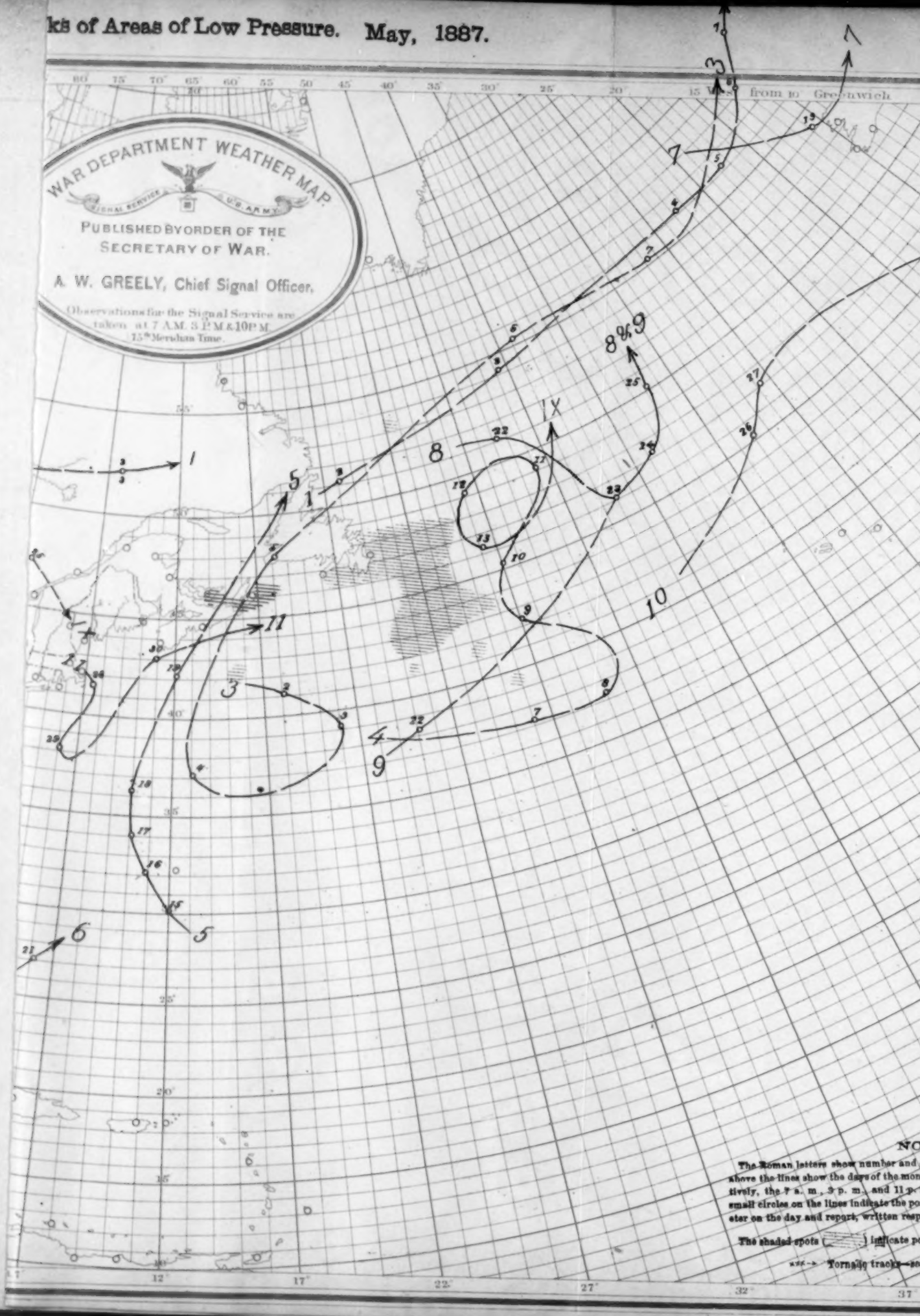
b 19,320, record for 30 days.

Form 106 G 1884.

Chart I. Tracks of Areas of L



ks of Areas of Low Pressure. May, 1887.


WAR DEPARTMENT WEATHER MAP.
SIGNAL SERVICE U.S. ARMY
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
Observations for the Signal Service are taken at 7 A.M. 3 P.M. & 10 P.M. 75th Meridian Time.
from Greenwich
I
II
III
IV
V
VI
VII
VIII
IX
X
NO
The Roman letters show number and
above the lines show the days of the mon
tively, the 7 a. m., 3 p. m., and 11 p.
small circles on the lines indicate the po
ster on the day and report, written resp
The shaded spots
indicate p
Tornado tracks—so

NOTES.

number and order of areas of low pressure. The figures
ys of the month, those below (1, 2, and 3) indicate, respec-
. and 11 p. m. (75th meridian time) observations. The
dicate the position of the centre of the area of low barom
written respectively above and below the line.

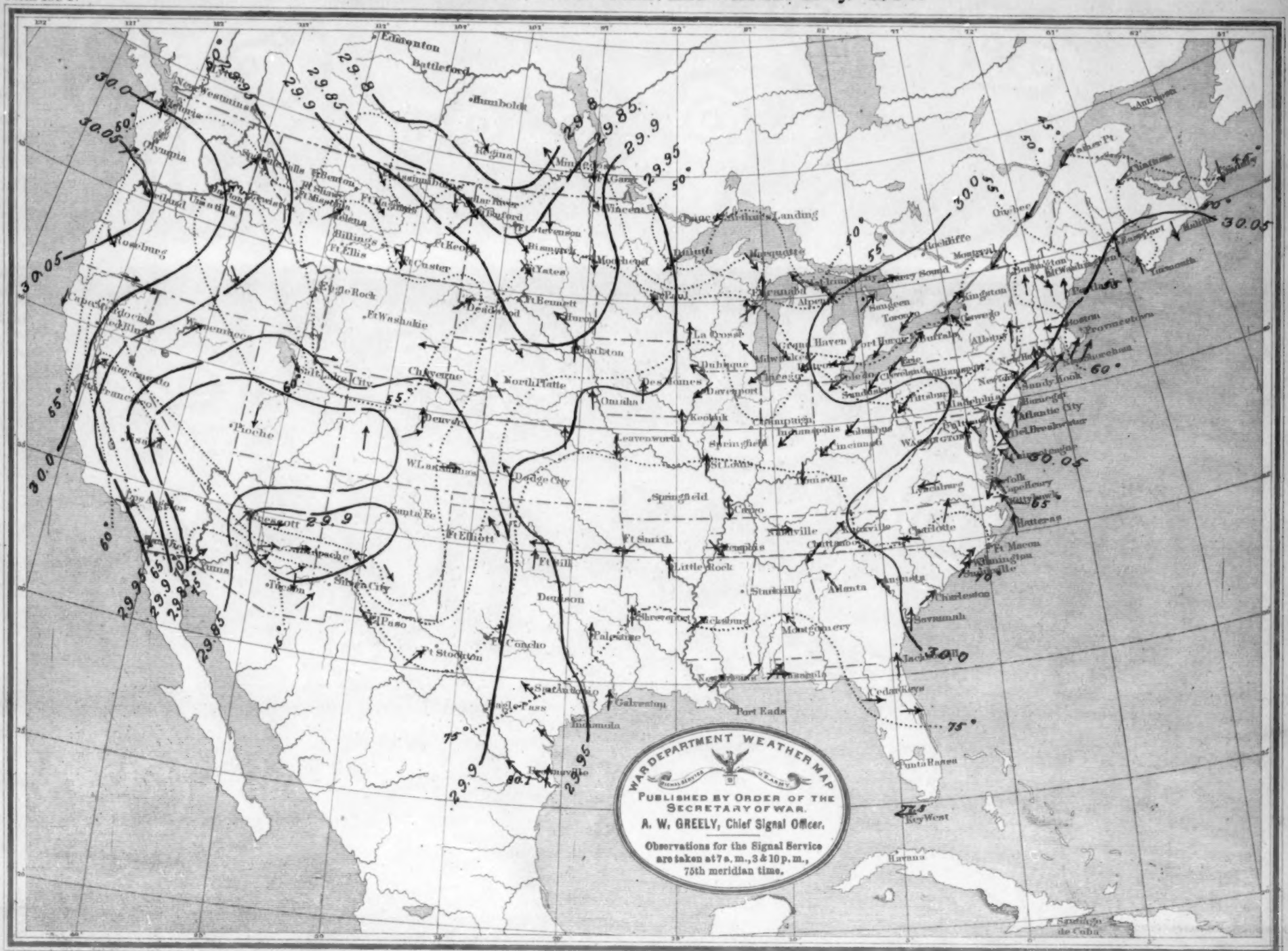
) indicate position of icebergs observed.

ic tracks—see tabulated list in Review.

Signal Office, Feb.

Form 106 F.

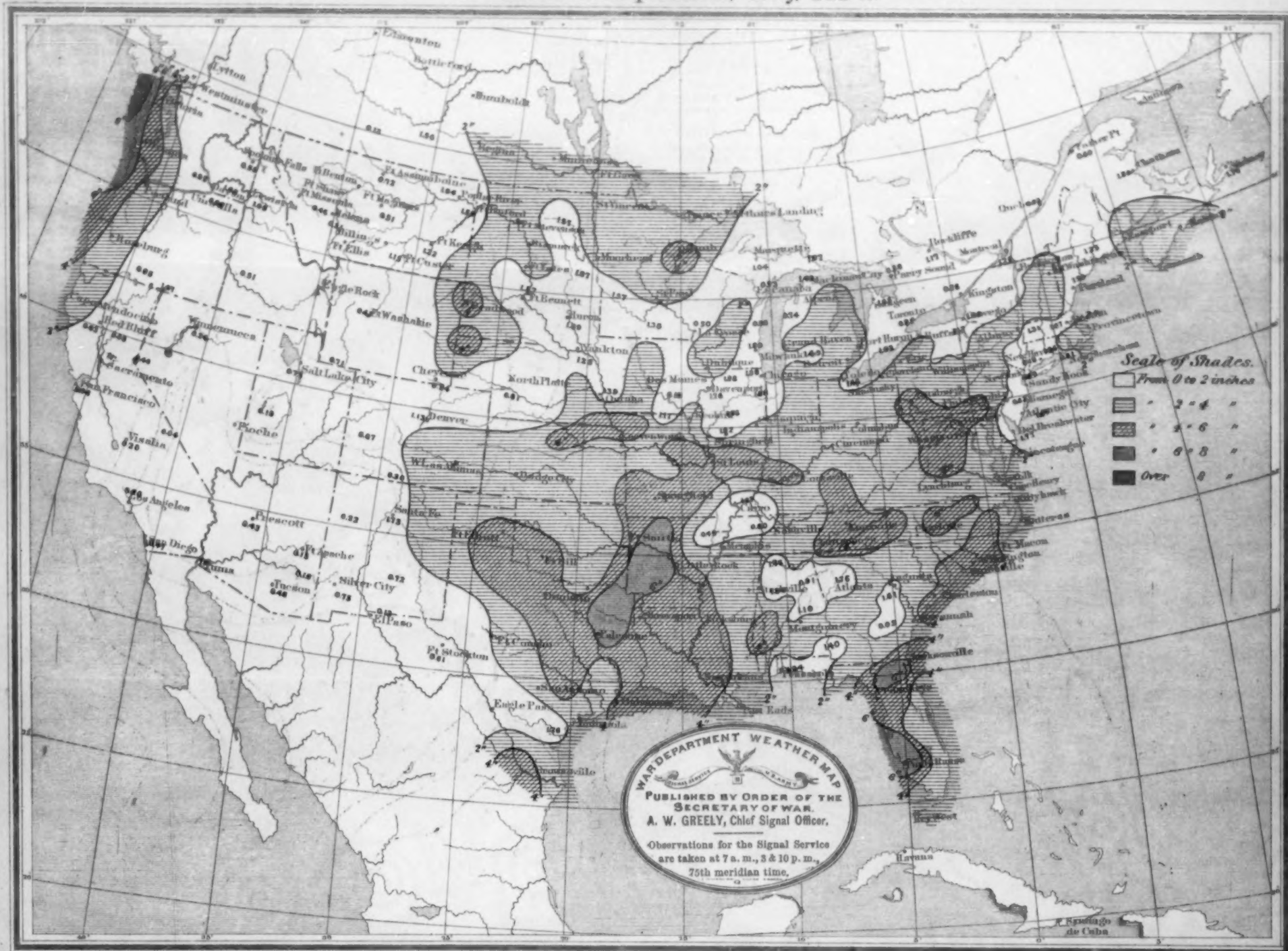
Chart II. Isobars, Isotherms, and Winds. May. 1887.



Signal Office Lith.

Form 106 F.

Chart III. Precipitation, May, 1887.

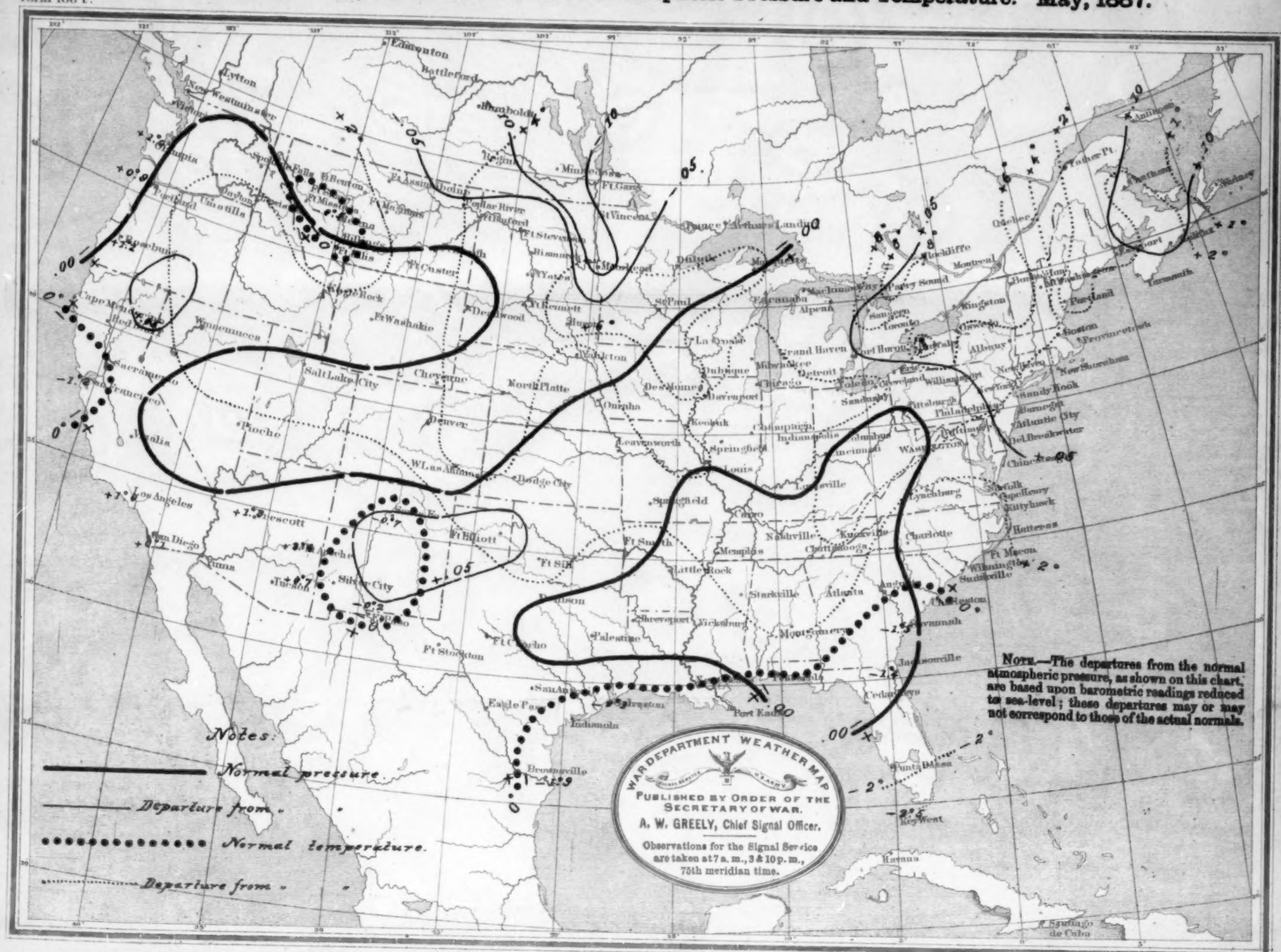

Scale of Shades.
From 0 to 2 inches
" 2 " 4 "
" 4 " 6 "
" 6 " 8 "
Over 8 "
WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
Observations for the Signal Service are taken at 7 a. m., 3 & 10 p. m., 75th meridian time.

Signal Office Lith.

Chart IV. Departures from Normal Atmospheric Pressure and Tem...

Form 106 F.

Chart IV. Departures from Normal Atmospheric Pressure and Temperature. May, 1887.


Notes.
Normal pressure.
Departure from .
Normal temperature.
Departure from .
WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
Observations for the Signal Service are taken at 7 a. m., 3 & 10 p. m., 75th meridian time.
NOTE.—The departures from the normal atmospheric pressure, as shown on this chart, are based upon barometric readings reduced to sea-level; these departures may or may not correspond to those of the actual normals.

Signal Office Lith.

Voluntary observers of the Signal Service, on land, from whom meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for May, 1887.

Observer and place of observation.

Alexander, S., Birmingham, Mich.
Anderson, Dr. W. W., Stateburg, S. C.
Altaffer, J. M., Independence, Kans.
Abbott, Dr. E. K., Salinas, Cal.
Arents, Hiram, Oroville, Cal.
Adams, A. H., Fort Meade, Fla.
Avey, O. H., Oskaloosa, Iowa.
Beans, Thos. J. Moorestown, N. J.
Bell, Joseph, Franklin, Pa.
Boerner, Prof. Chas. G., Vevay, Ind.
Bently, David, Willows, Cal.
Bayerly, J. F., Spartanburg, S. C.
Ballou, Dr. N. E., Sandwich, Ill.
Bennett, Geo., Bandon, Oreg.
Boies, Lt. A. H., Hudson, Mich.
Beecher, Chas., Wysox, Pa.
Baker, Dr. Henry B., Lansing, Mich.
Beall, Dr. R. L., Lenoir, N. C.
Brendel, Dr. Fred., Peoria, Ill.
Bartlett, E. B., Vermillion, N. Y.
Briggs, John, Albany, Oreg.
Betts, Prof. Arthur, Webster, Dak.
Breed, J. E., Embarras, Wis.
Brown, J. B., Morganfield, Ky.
Birt, Thomas, Utica, N. Y.
Broberg, Mrs. Mary W., Manatee, Fla.
Black, W. H., Kalamazoo, Mich.
Blachly, C. P., Manhattan, Kans.
Bridges, Q. A., Berlin Mills, N. H.
Bowman, Peter, Ruggles, Ohio.
Boyd, Joseph, Oskaloosa, Iowa.
Cook, S. A., Milledgeville, Ga.
Carrington, G. D., Brownville, Nebr.
Calhoun, P. B., Austin, Tenn.
Cowgill, Prof. E. B., Manhattan, Kans.
Charbonnier, Prof. L. H., Athens, Ga.
Casey, Geo., Auburn, N. Y.
Crawford, E. A., Liberty Hill, La.
Cornell University, Ithaca, N. Y.
Chapin, Adams, Poway, Cal.
Cutting, Dr. Hiram A., Lunenburg, Vt.
Clark, F. A., Weldon, N. C.
Cass, John J., Allison, Kans.
Cutler, B. B., Heath, Mass.
Collie, G. L., Delavan, Wis.
Conant Observatory, Dudley, Mass.
Cotton, Dr. D. B., Portsmouth, Ohio.
Cheney, Wm., Minneapolis, Minn.
College of Sacred Heart, Prairie du Chien, Wis.
Carter, Rev. Dr. W. H., Tallahassee, Fla.
Cummings, L. D., Palmyra, N. Y.
Crump, M. H., Bowling Green, Ky.
Cochran, Wm. P. Wakefield, Kans.
Caulkins, John S., Thornville, Mich.
Cole, Seward, Cahuenga, Cal.
Chandler, Dr. W. J., South Orange, N. J.
Cass, W. Earle, Roseland, N. J.
Comstock, Prof. F. M., LeRoy, N. Y.
Collin, Prof. Alonzo, Mt. Vernon, Iowa.
Dow, Roswell, Sycamore, Ill.
Dean, W. S., Lordstown, Ohio.
Dinsmore, Prof. F. H., Emporia, Kans.
Deweese, D. W., Hanging Dog, N. C.
Dollenmayer, E. T., Wilson, Kans.
Dudley, Chas. B., Altoona, Pa.
Dunlap, W. L., Tecumseh, Nebr.
Dazey, J. B., Charleston, Ill.
Deming, H. D., Wellsborough, Pa.
Downing, A. L., Concord, N. H.
Dunn, Samuel A., Brooklyn, N. Y.

Observer and place of observation.

Dozier, Wm., Mattoon, Ill.
Dewhurst, Rev. E., Voluntown, Conn.
Day, Theodore, Dyberry, Pa.
Ellason, W. A., Statesville, N. C.
Ellis, John, Marquette, Nebr.
Ewell, Dr. M. D., South Evanston, Ill.
Evans, J. W., Alma, Colo.
Eckstein, Rev. M., Conception, Mo.
Ferris, B. F., Sunman, Ind.
Friend, Chas. W., Carson City, Nev.
Ferrill, B. P., Duke, Fla.
Frear, Wm., State College, Pa.
Fernald, Prof. M. C., Orono, Me.
Fleming, John, Readington, N. J.
Fuller, Edw. N., Tacoma, Wash.
Featherston, Wm., Globe, Kans.
Field, T. G., Parkersburgh, W. Va.
Gibson, J. H., Salina, Kans.
Gore, Prof. J. W., Chapel Hill, N. C.
Granville, John, J., East Saginaw, Mich.
Grant, J. B., Bay Port, Mich.
Gates, W. B., Burlington, Vt.
Graves, A. B., Belleville, Kans.
Gillingham, Milnor, Fallsington, Pa.
Guerrero, J. T., Mazatlan, Mex.
Gowey, H. D., North Lewisburg, Ohio.
Green, Dr. Jesse C., West Chester, Pa.
Gerrish, S. H., Sacramento, Cal.
Geddings, Dr. W. H., Aiken, S. C.
Goodwin, Rev. William, North Colebrook, Conn.
Gordon, Dr. G. G., Swartz Creek, Mich.
Garlick, Rev. Dr. J. R., Bruington, Va.
Gray, Capt. A. W., Kenewick, Wash.
Grathwohl, John, Blooming Grove, Pa.
Humphrey, Dr. I., Fairbury, Nebr.
Harvard College Observatory, Cambridge, Mass.
Hammitt, John W., College Hill, Ohio.
Harris, T. C., Raleigh, N. C.
Heaton, Isaac E., Fremont, Nebr.
Hoskinson, R. M., Blakely, Wash.
Holt, A. K., Riverside, Cal.
Hyde, G. A., Cleveland, Ohio.
Haywood, John, Westerville, Ohio.
Hartzler, J. A., Mottville, Mich.
Hole, C. F., Butlerville, Ind.
Held, Rev. F. B., Mount Angel, Oreg.
Heatwole, L. J., Dale Enterprise, Va.
Hatch, A. H., Windsor, Ill.
Harris, W. C., Dover, N. J.
Hall, J. B. Worcester, Mass.
Hunter, Dr. T. C., Napoleon, Ohio.
Hewit, S. F. H., Middlebrook, W. Va.
Helm, Thos. B., Logansport, Ind.
Heacock, J. L., Quakertown, Pa.
Hazen, Rev. A., Deerfield, Mass.
Harper, E. G., Harper's Ferry, Ky.
Ireland, W. H., Rappahannock, Va.
James, John W., Marengo, Ill.
Jennings, Sgt. T. B., Lebo, Kans.
Jones, Dr. E. U., Taunton, Mass.
Jordan, Dr. M. D. L., Milan, Tenn.
Kirkwood, E., Mauzy, Ind.
Knapp, J. G., Limona, Fla.
Keese, G. Pomeroy, Cooperstown, N. Y.
Lincoln, A. T., Marion, Va.
Loud, Prof. F. H., Colo. Springs, Colo.
Lüps, Miss Clasina, Manitowoc, Wis.
Loomis, J. C., Jeffersonville, Ind.

Observer and place of observation.

Logan, David, Meadville, Pa.
Luther, S. M., Garrettsville, Ohio.
Lerch & Rice, Bethlehem, Pa.
Loundes, R. T., Clarksburg, W. Va.
McDonogh Institute, McDonogh, Md.
McDowell, W. R., Highmore, Dak.
Morgan, L. Ray, Phillipsburg, Pa.
Marshall, Gregory, Cresco, Iowa.
Massachusetts Agricultural Experimental Station, Amherst, Mass.
McCrendy, Miss L. A., Ft. Madison, Iowa
Miller, H. D., Drifton, Pa.
McCarthy, Gerald, Kendall Green, D. C.
Mead, Elwood, Colo. Ag. College, Fort Collins, Colo.
McKenzie, Dr. M., Centreville, Mo.
Moore, C. R., Bird's Nest, Va.
Mikesell, Thos., Wauseon, Ohio.
Micklem, J. H., Variety Mills, Va.
Macrae, Colin, Kirkwood, S. C.
Meehan, Thomas, Germantown, Pa.
Memminger, E. R., Flat Rock, N. C.
Moore, Dr. J. W., Easton, Pa.
Moore, Nathan, Grampian Hills, Pa.
Mitchell, Dr. D. W., Harrisville, Mich.
Nordberg, Prof. A., Richardton, Dak.
Newcomb, G. S., Westborough, Mass.
Newell, W. C. T., Henry, Dak.
Norcom, Prof. T. J., Reidsville, N. C.
Neal, Dr. J. C., Archer Fla.
Osborn, Dr. T. C., Cleburne, Tex.
Olds, H. D., Cedar Rapids, Iowa.
Ogden, Charles, Elkin, Ky.
Owsley, Dr. J. B., Jacksonborough, O.
Pearce, Thomas, Eola, Oreg.
Partrick, J. M., North Volney, N. Y.
Palmer, Frank W., Antrim, N. H.
Purdue University, Lafayette, Ind.
Peckham, Prof. W. C., Brooklyn, N. Y.
Pettersén, Dr. F., Comfort, Tex.
Postma, H. Y., Egg Harbor City, N. J.
Poynter, Dr. Marcus E., Midway, Ky.
Pendleton, A., Nicolaus, Cal.
Robins, Chas. E., Alva, Fla.
Romig, J. K., La Grande, Oreg.
Richmond, S. L., Salem, N. J.
Renfrew, H. N., Bancroft, Iowa.
Remington, C. V. S., Fall River, Mass.
Robertson, T. D., Rockford, Ill.
Roberts, Luke, Clinton, Iowa.
Rodman, T. R., New Bedford, Mass.
Runge, C., New Ulm, Tex.
Richardson, C. F., Beverly, N. J.
Rotch, A. L., Blue Hill Observatory, Blue Hill, Mass.
Rice, Chas. W., Yellow Springs, Ohio.
Swezey, Prof. G. D., Crete, Nebr.
Stern, Jacob T., Logan, Iowa.
Starr, Prof. Fred'k, Cedar Rapids, Iowa.
Smith, H. D., Monticello, Iowa.
Simmons, Prof. W. G., Wake Forest, N. C.
Snow, Prof. F. H., Lawrence, Kans.
Shaw, E., Ninnescah, Kans.
Seltz, Chas., De Soto, Nebr.
Shriver, E. T., Cumberland, Md.
Shepard, E. M., Springfield, Mo.
Schleicher, Rob't Lewiston, Idaho.
Shriver, Howard, Wytheville, Va.
Scott, Thos. G., Forsyth, Ga.
Smith, Prof. T. B., Fayette, Mo.

Observer and place of observation.

Silvius, Urius O., Franklin, Wis.
Stucky, Dr. C. T., Helvetia, W. Va.
Slade, Elisha, Somerset, Mass.
Sonedecker, Rev. C. H., Tiffin, Ohio.
Smith, John R., North Truro, Mass.
Sim. J. R., Summit, Va.
Scribner, H. F. J., Strafford, Vt.
Strong, S. B., Setauket, N. Y.
Swartz, John J., Parkston, Dak.
Samostz, Oscar, Austin, Tex.
Smith, George F., New Midway, Md.
Standenmayer, Dr. L. R., Lincolnton, N. C
Trembly, Dr. J. B., Oakland, Cal.
Thornton, Prof. N. W., Geneseo, Ill.
Tillinghast, C. B., Albany, N. Y.
Tilford, C. M., Mount Blanco, Tex.
Teele, Rev. A. K., Blue Hill, Mass.
Truman, Geo. S., Genoa, Nebr.
Turnbo, Silas C., Pro Tem, Mo.
Terborg, Rev. J. E., Pekin, Ill.
Thompson, R. J., Tiffin, Ohio.
Voegeli, Adolphus, Des Moines, Iowa.
Went, E. C., Frankfort, Ky.
Washburn Observatory, Madison, Wis.
Wild, Rev. E. P., Newport, Vt.
Williams, Rev. C. P., Ashwood, Tenn.
Wing, Miss M. E., Charlotte, Vt.
West, Silas, Cornish, Me.
Wells, Rev. Charles L., Gardiner, Me.
Wylie, Wm., Mount Forest, Canada.
Wait, S. E., Traverse City, Mich.
Washington Aqueduct. { Receiving Reservoir, D.C / Distributing " " / Great Falls Reservoir, Md / Rock Creek Bridge, D. C.
Woodstock College, Woodstock, Md.
Williams College Observatory, Williamstown, Mass.
Wolfe, John H. Wellington, Kans.
Wülfke, E. F., Independence, Iowa.
Wearmouth, James, University of Virginia, Va.
Winipiseogee Lake Cotton and Woolen Manufacturing Co. { Weir's Bridge, N. H. / Woodstock, N. H. / Wolfborough, N. H. / Lake Village, N. H. / Bristol, N. H. / Belmont, N. H. / Ashland, N. H.
Willis, O. R., A. M., Ph. D., White Plains, N. Y.
Wood, Joseph, Bar Harbor, Me.
Wigg, Dr. Geo., East Portland, Oreg.
Wright, J. W. A., Greensborough and Livingston, Ala.
Whitney, Chas. E., Humphrey, N. Y.
Wistrom, M. F., Harvard, Nebr.
Widman, Rev. C. M., Grand Coteau, La.
Williams, Dr. A. C., Elk Falls, Kans.
Wedge, J. C., Fond du Lac, Wis.
White, Rev. J. H., Georgiana, Fla.
Wilson, W. T., Clayton, N. J.
White, J. G., Lincoln, Nebr.
Whitmore, J. E., Gallinas Spring, New Mexico.
Walton, J. P., Muscatine, Iowa.
Waterman, Wm., Hay Springs, Nebr.
Webster, Chas. H., Nashua, N. H.
Yates, T. P., Factoryville, N. Y.
Young, Geo. R., Penn Yan, N. Y.

Military posts from which meteorological reports were received, through the Surgeon General of the Army, in time to be used in the preparation of the Monthly Weather Review for May, 1887.

Alcatraz Island, Cal.
Angel Island, Cal.
A. Lincoln, Fort, Dak.
Bayard, Fort, New Mex.
Benicia Barracks, Cal.
Bidwell, Fort, Cal.
Brady, Fort, Mich.
Boisé Barracks, Idaho.
Concho, Fort, Texas.
Columbus, Fort, N. Y. H.
Camp Sheridan, Wyo.
Gaston, Fort, Cal.
Gibson, Fort, Ind. T.
Hays, Fort, Kans.
Hot Springs, Ark.
Klamath, Fort, Oreg.
Keogh, Fort, Mont.
Lewis, Fort, Colo.
Laramie, Fort, Wyo.
Meade, Fort, Dak.
McIntosh, Fort, Tex.
Missoula, Fort, Mont.
Mason, Fort, Cal.
McDermit, Fort, Nev.
McDowell, Fort, Ariz.
Monroe, Fort, Va.
Mojave, Fort, Ariz.
Madison Barracks, N. Y.
McHenry, Fort, Md.
Mount Vernon B'ks, Ala.
McKinney, Fort, Wyo.
Niagara, Fort, N. Y.
Niobrara, Fort, Nebr.
Pembina, Fort, Dak.
Presidio of San F., Cal.
Plattsburg Barracks, N. Y.
Robinson, Fort, Nebr.
Reno, Fort, Ind. T.
Randall, Fort, Dak.
Ringgold, Fort, Tex.
Riley, Fort, Kans.
Snelling, Fort, Minn.
St. Francis Bk's, St. Augustine, Fla.
Sisseton, Fort, Dak.
Shaw, Fort, Mont.
Sherman, Fort, Idaho.
Selden, Fort, Nebr.
Supply, Fort, Ind. T.
Sully, Fort, Dak.
Spokane Fort, Wash.
Sidney, Fort, Nebr.
Totten, Fort, Dak.
Townsend. Ft., Wash.
Union, Fort, N. Mex.
Washakie, Fort, Wyo.
West Point Military Academy, N. Y.
Walla Walla, Ft., Wash.
Wingate, Fort, N. Mex.
Yates, Fort, Dak.

State weather services from which meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for May, 1887.

Alabama, P. H. Mell, jr., director, Auburn, Ala.
Colorado, Prof. F. H. Loud, director, Colorado Springs, Colo.
Illinois, Col. Charles F. Mills, director, Springfield, Ill.
Indiana, Prof. H. A. Huston, director, La Fayette, Ind.
Iowa, Dr. Gustavus Hinrichs, Iowa City, Iowa.
Kansas, Prof. J. T. Lovewell, director, Topeka, Kans.
Michigan, N. B. Conger, Sgt., Signal Corps, director, Lansing, Mich.
Minnesota, Prof. W. W. Payne, director, Northfield, Minn.
Mississippi, Prof. R. B. Fulton, director, Oxford, Miss.
Missouri, Prof. Francis E. Nipher, director, Saint Louis, Mo.
Nebraska, Prof. Goodwin D. Swezey, Director, Crete, Nebr.
New England Meteorological Society, Prof. Wm. H. Niles, of Boston, Mass., President; Prof. W. M. Davis, of Cambridge, Mass., Secretary.
New Jersey, Prof. George H. Cook, director, New Brunswick, N. J.
North Carolina, Dr. Charles W. Dabney, jr., director, Raleigh, N. C.
Ohio, Prof. Benj. F. Thomas, director, Ohio State University, Columbus, Ohio.
South Carolina, Hon. A. P. Butler, director, Columbia, S. C.
Tennessee, H. C. Bate, director, Nashville, Tenn.

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do. minimum do.	2.75	do.	.60
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